

• SCIENCE TODAY AND TOMORROW

# Science Everywhere



CRAIG | LEMBACH



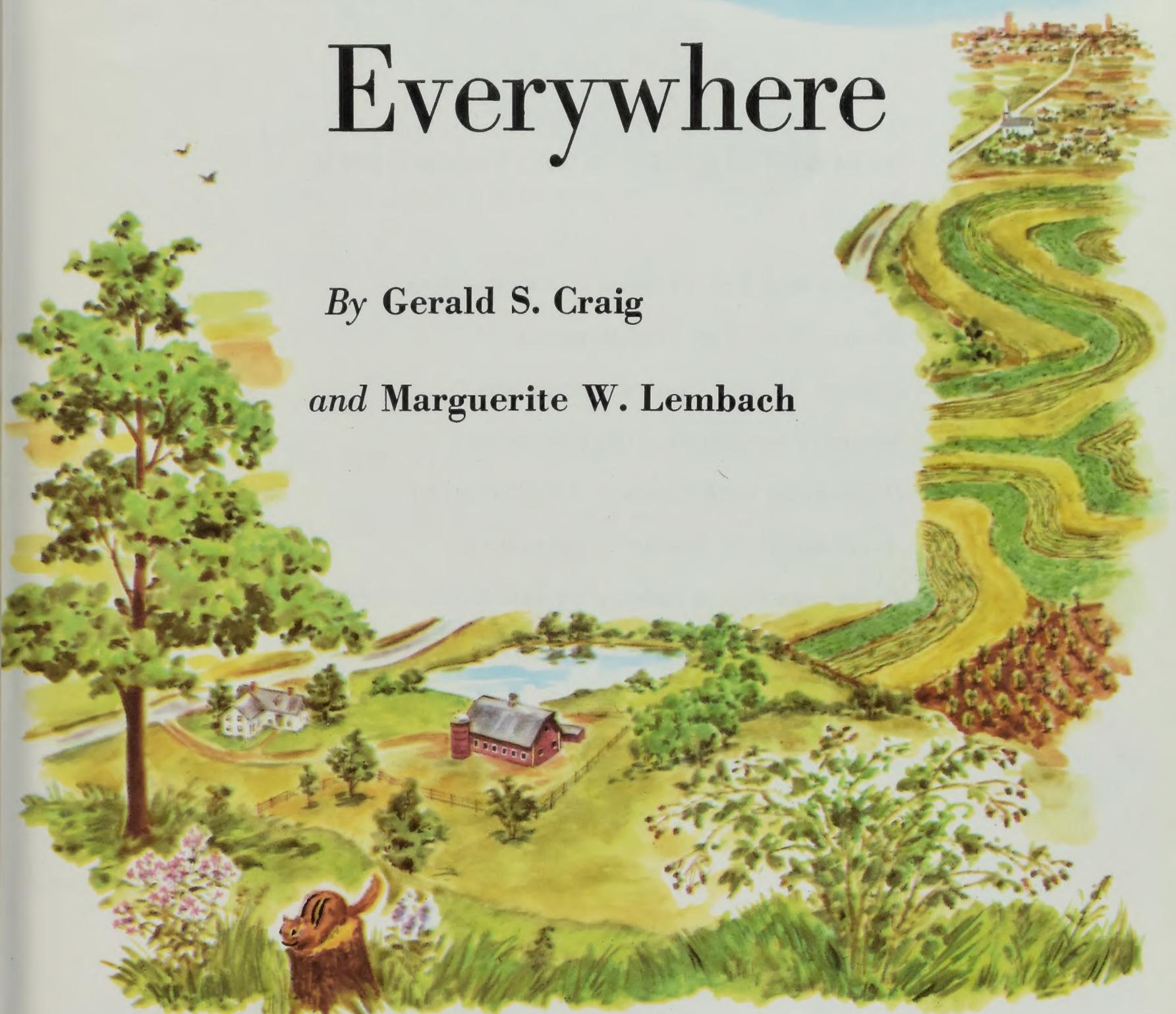




# Science Everywhere

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## **SCIENCE TODAY AND TOMORROW**

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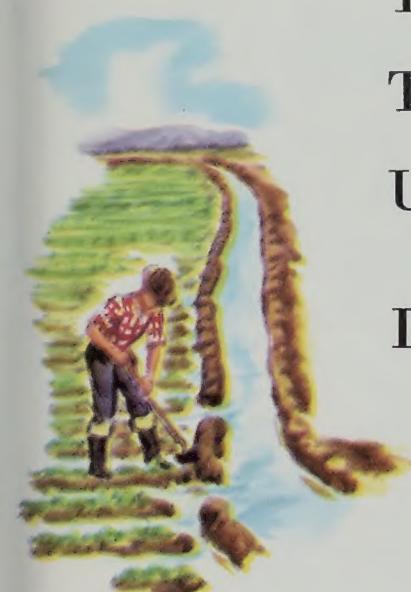
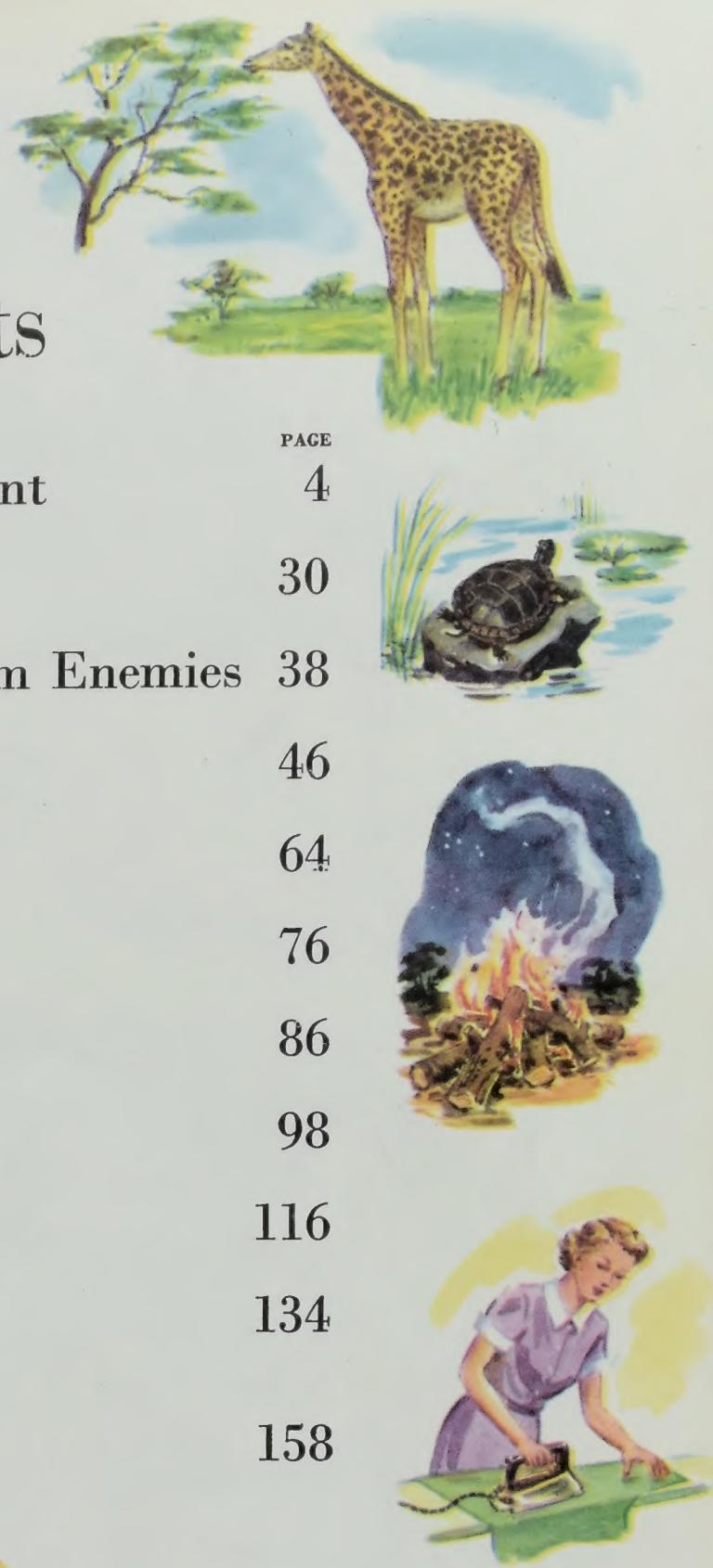
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*A Teachers' Manual accompanies each book*

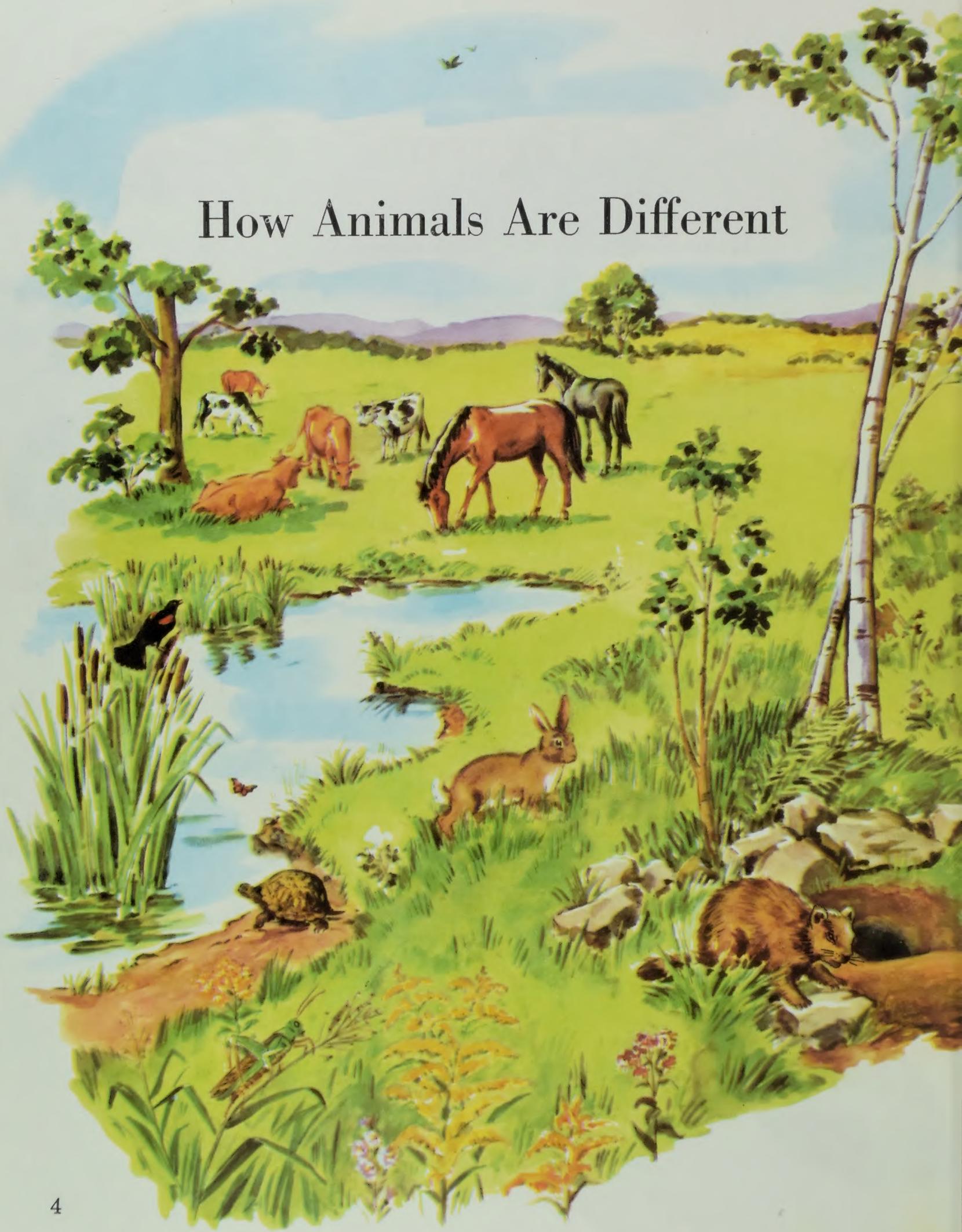
*Illustrations by PRU HERRIC, DOROTHY AND SY BARLOWE,  
FOSTER CADDELL, JR., and HARRY MICHAELS*

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# How Animals Are Different





## Many Kinds of Animals

Many different kinds of animals live on the earth. There are animals large and small. There are animals short and tall.

Some animals are covered with fur. Some are covered with feathers. And still other animals have scales or shells to cover them. Do you know any animals that have scales or shells?

Look at all the animals in the picture. What large animals do you see? Can you see any small animals with scales or shells? Which animals have fur to cover them? Do you see any animals with feathers?

How many of these different animals do you know?



Think about the many kinds of animals you have seen. Have you a pet dog or cat or rabbit? Do you enjoy your pet?

Have you seen cows, horses, and sheep in the country? Have you seen chickens, ducks, and turkeys?



What animals have you seen at the circus? Tell the boys and girls about these animals.



What animals have you seen in a park? Are these large or small animals?



Make a list of all the different animals you can name. Ask your teacher to help you. Ask your teacher to help you to write their names.

You will enjoy the next part of the story about animals more if you write your list now. Then you may use your list as you read the story.



## Animals Large and Small

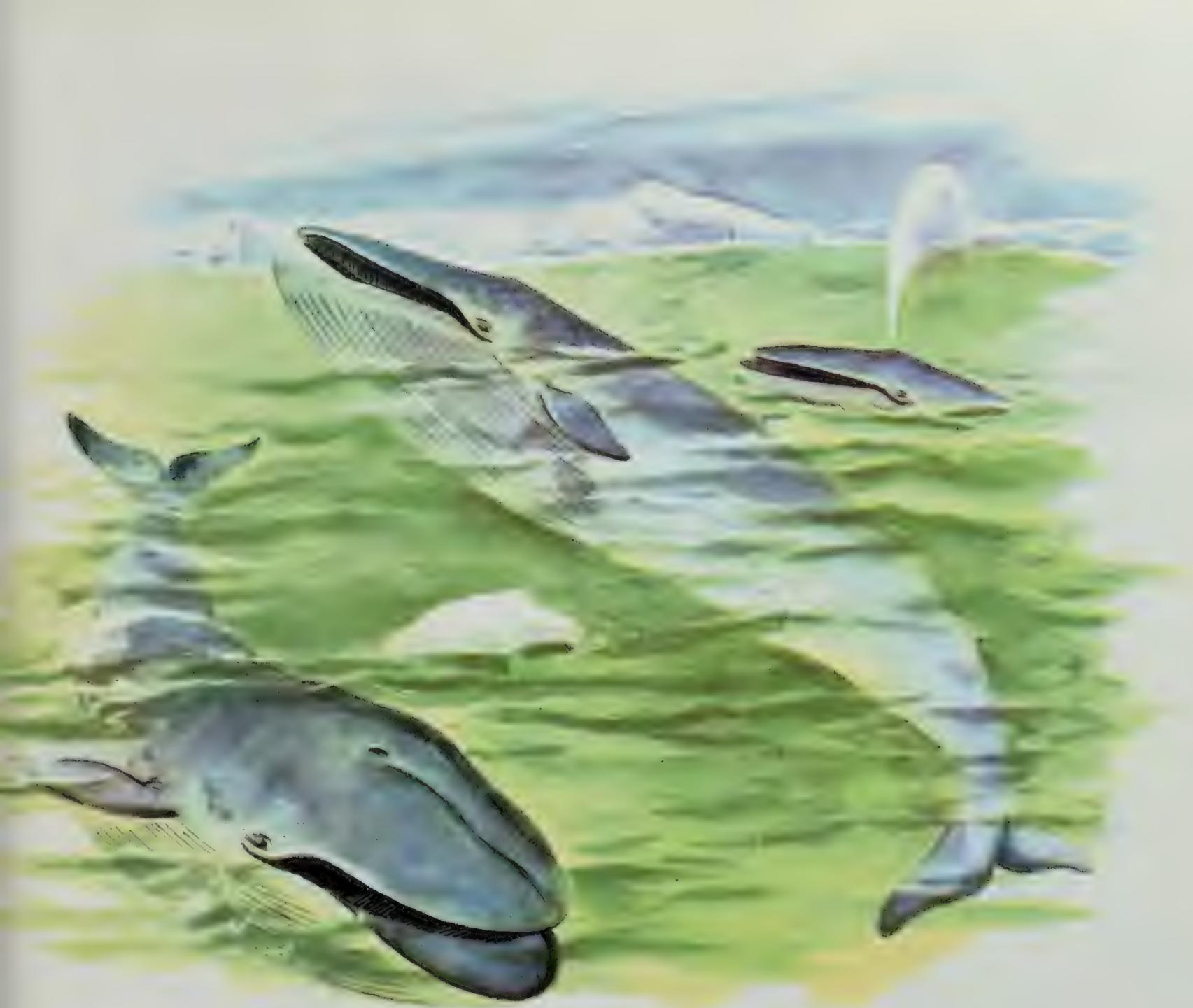
Some animals are very large, and some are very small. Which animal on your list is the largest one? Which animal is the smallest one?

Some animals are smaller than any you may have put on your list. Here are pictures of small animals. Which ones do you know?

Some animals are so small that you cannot see them without looking at them through a magnifying glass. Can you think of an animal as small as that?

Other animals are very large. Some are so big that you could not get them into your room at school. Do you know of any animal as large as that?





## Learning About Large Animals

Scientists think that a blue whale is the largest animal which has ever lived on the earth or in its waters.

A blue whale is too big to get into your schoolroom. It is too tall and it is much, much too long.

Even a baby whale is very large.



You may think that an elephant is a large animal. It is very large. But if an elephant could stand beside a whale, you would see that the elephant is very much smaller. A whale is much bigger than an elephant.



When you stand next to a grownup, that person seems large. But if a grownup stands beside a very big elephant, that person seems small.

Both a whale and an elephant are much larger than a person.

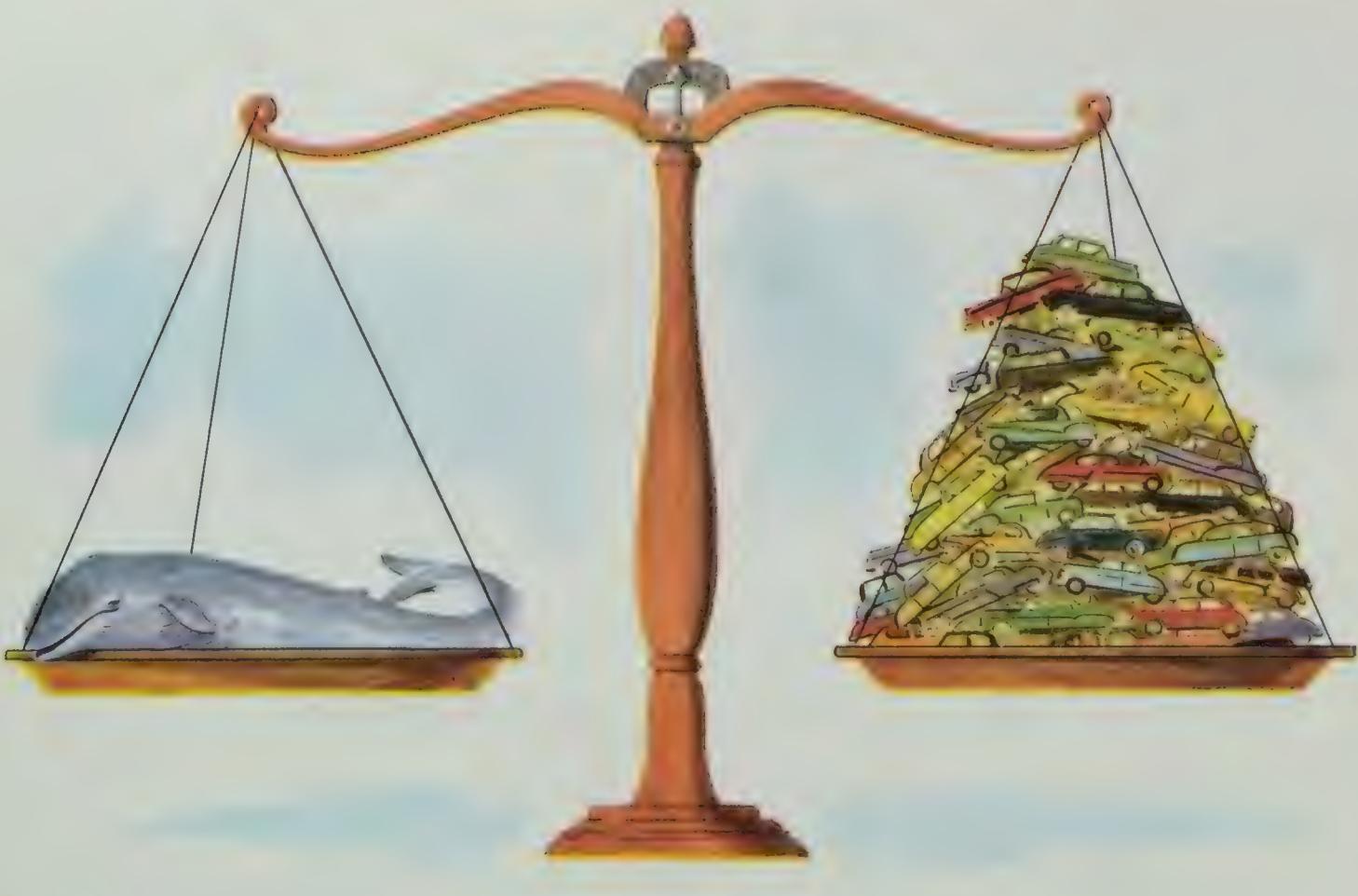


Here is the way a whale, an elephant, a man, and a boy would look if they could stand side by side.



A blue whale sometimes grows to be one hundred feet long. This is very long for an animal.

Try to measure one hundred feet on the playground. In this way you can find out just how long a blue whale may grow.



Whales live in the ocean. They can swim and float easily in the water. The water helps to hold them up. Whales are so large and heavy that it would be very hard for them to move about on land.

Large whales sometimes weigh one hundred and fifty tons. This is about the same as one hundred and fifty cars would weigh. Think of one animal weighing as much as one hundred and fifty cars !

You may know of some other large animals too. Horses and cows are large animals. Bears and lions are large animals. But they are not so large as a blue whale.

A whale is the largest animal living on the earth, but a giraffe is the tallest. Even a young giraffe is often taller than a grown person.

Some giraffes are three times as tall as a grown person. Do you think a giraffe could stand up in your room at school?

Look at the giraffe nearest you in the picture. See its long legs. And look at its long, long neck.

With its head so high, a giraffe can see all about it. It can tell if danger is near. Then, with its long legs, the giraffe may go away to a safe place.

Giraffes eat the leaves which grow on tall trees. With such a long neck, a giraffe can reach its food. This is an easy meal!

A giraffe may look queer to us, but long legs and a long neck are very helpful to this animal.





These animals are bison. A bison is a large animal. A bison is not so large as a whale or an elephant, but it is much larger and much heavier than a grown person.



An elk is another very large animal. It stands as tall as a horse. But an elk has very big antlers. These antlers make an elk seem much larger than a horse. What other large animals with antlers do you know ?

When you stop to think about it, there are many large animals on this earth. What large animals have you seen ?

# Learning About Small Animals

Look at the small animals at the right. Have you ever seen animals like these? They are often called prairie dogs. A prairie dog is only six or seven inches tall.

These little animals are not really dogs. They are ground squirrels. But because they make a barking sound, some people have given them the name *prairie dog*.

If your home is on the prairie, you may have seen some of these small animals.

A mud turtle is a small animal, too. It likes to stay near ponds and brooks. Mud turtles may be small, but they know how to get an easy meal. They often eat the worms fishermen use when they go fishing.

If you live near a pond or brook, look for this small animal the next time you play there.





A hummingbird is another small animal. In the picture you see a grown hummingbird. It is not much larger than the flower it is near.

A hummingbird is a very small animal, but it can do many things that larger birds do. A hummingbird can fly many, many miles without stopping. It flies hundreds of miles over the water each year to go from its summer home to its winter home.

The hummingbird is one of the smallest of all birds. It is one of the fastest too. When it flies a hummingbird often moves its wings so fast that they cannot be seen clearly.



A grown hummingbird is about three inches long. Young hummingbirds are even smaller. Two or three baby hummingbirds can be held in a spoon.



A hummingbird often builds its nest on a tree branch. The bird covers the nest with small plants. The nest is very small and cannot always be seen. It looks like a part of the tree branch.

A hummingbird makes a very small nest. It is often not much more than one inch across. Such a nest looks like a tiny cup.



A hummingbird may use spider webs in building this small nest. The inside of the nest may be covered with the soft part of plants, called plant down. The baby birds stay in the soft nest until they can fly.



Another small animal is a field mouse. It is so small that it can hide in the grasses of a meadow or field.

A field mouse may be very small, but it eats and eats. Sometimes a field mouse will eat nearly as much as it weighs in one day.

An earthworm is a very small animal, too. There are hundreds and hundreds of these small animals in the soil.

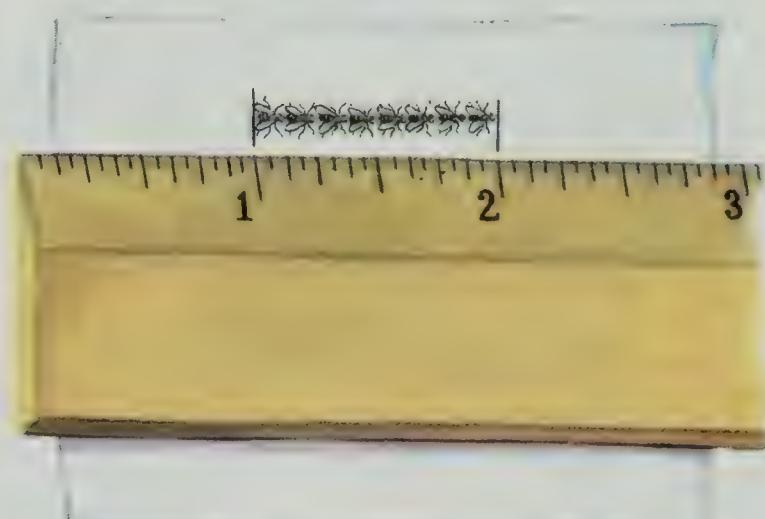
You may have seen earthworms when they came to the top of the ground after a very hard rain. Earthworms may be small, but they move tons and tons of soil as they push through the earth.

Ants are small animals, too. There are many kinds of them. The ants in the picture are taking bread crumbs to their anthill. They are not much larger than the bread crumbs.

Another smaller animal is a little fruit fly. It is even smaller than an ant. It often lives on fruits. You may see fruit flies near fruits in your home or around the fruits in a food store.

How small a fruit fly is! You must use a magnifying glass to see it well. Here is the way one might look through a magnifying glass.

Make two marks, one inch apart, on your paper. You could put eight fruit flies between the marks. Think how small the flies would be!



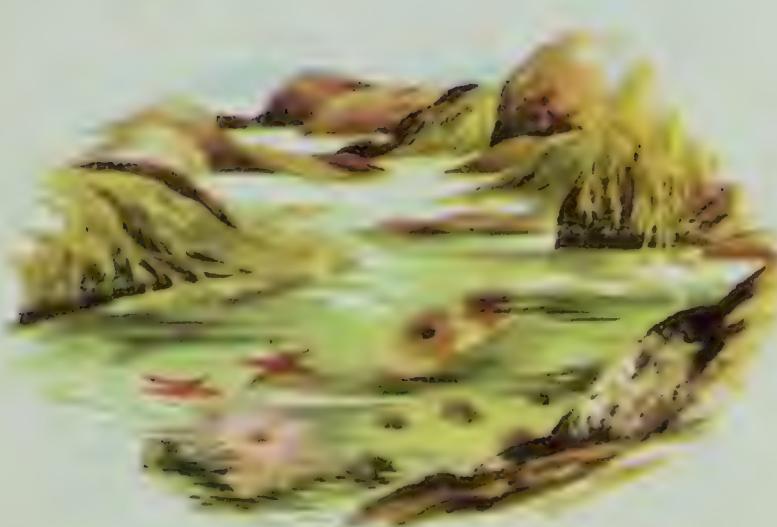
Some people think that these little flies are baby flies. But they are not. They are grown flies. They will not get any larger. Eight fruit flies in one inch! These are very small animals.

# Animals Have Many Shapes

Animals have many, many shapes. Some of these shapes are very surprising.



There are animals which look like small brown sticks. There are others that look like the stems of a green plant. These animals look like a thin stem.



There are some animals that are shaped like flowers. Some animals are shaped like stars. Here is another animal, which looks like a ball of stickers.



Some animals look like dead leaves on a plant. Did you ever think there could be so many different animal shapes?

In the picture you can see other animals with different shapes. As you look at the picture, you may think, "What a pretty garden ! What bright colors ! I have never seen flowers like these before. But where are the animals ? I don't see any in this picture."

You may be surprised to know that this is a garden of animals and not a garden of flowers. The animals are brightly colored. What colors do you see ?

These animals live in the sea. They look very much like flowers. Because they have the shapes and colors of flowers, they are sometimes called sea flowers.



In the picture you can see some animals with a strange shape. If you have played along the seashore, you may have found some of them on the sand.

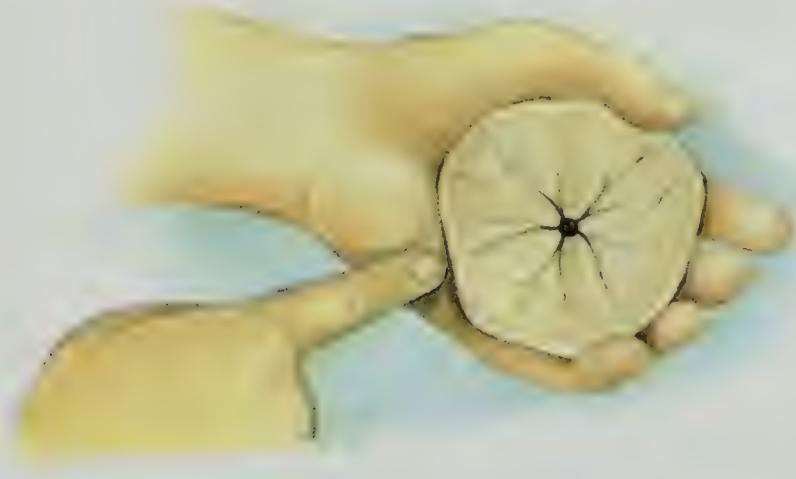
People sometimes call these animals sea cookies. They are round and flat, like cookies, and some of them are a light brown in color.

Other people think these strange little animals look like round silver dollars. For this reason they are sometimes called sand dollars.

Sand dollars are often washed up on the shore by the waves. They have no arms or legs such as you have. They cannot move very far alone. Sand dollars go where the waves take them.



The sand dollar is a little, thin sea animal. On the underside of this animal there is a small hole. This is the sand dollar's mouth. All the food this little animal eats goes in through this little hole.



On the top of the sand dollar there is a pattern which looks like a flower. If you look carefully, you can count the five parts of the pattern.

Little holes make the pattern on the sand dollar's back. The sand dollar breathes through these holes. The sand dollar has a strange shape for an animal.





This strange-looking animal is a horned lizard. It is covered with many sharp horns, which give the animal its name. The horned lizard lives where it is dry and sunny. It sometimes hides under rocks. If you do not look carefully, you may think the horned lizard is a sharp, brown rock.



Here is an animal which looks as if it were covered with pins. Do you know the name of this animal? It is a porcupine.

Look out for the porcupine's stickers! They feel as much like pins as they look.

What strange-looking animals can you see near your home?



Here is another animal with a strange shape. It is a garden slug. You may have seen it in your garden.

This animal can change its shape. A slug can pull its body up until it is short and fat. Or a slug can make its body long and thin.



The animal in the picture is a dragonfly. Have you ever seen an animal like this?

A dragonfly looks something like a toy airplane. Its big wings and thin body make it look strange to us. But they are very useful to this animal.

A dragonfly uses its wings to help it move about to get food and fly away from danger. Its thin body is not always seen by animals which might eat it.

This shape is just right for a dragonfly.



Have you seen the animal in this picture? It is a caterpillar. But what a strange shape it has!

Its body goes up in the middle like a loop. And it has feet on both ends, but no feet in the middle.

This animal has three or four names. All the names come from the way it walks. Because it has no feet in the middle, this caterpillar walks first with the feet on one end of its body. Then it walks with the feet on the other end.

As the caterpillar walks, it seems to loop along, or inch along as if it were measuring something. For this reason, it is called a looper or an inch worm or sometimes a measuring worm.

Think of all these names for a small caterpillar with no feet in the middle of its body!



The shape of a rock barnacle may seem strange to you. This animal looks like a piece of shell or white rock. Inside each barnacle shell there is a very small animal. You do not see any of the animal but its shell.

Rock barnacles live on the rocks along the seashore. When a rock barnacle is very young, it fastens onto a rock. There it stays for the rest of its life. The rock barnacle cannot move from the rock.



Look at the sponge in the picture. Did you know that a sponge is an animal? Sponges are very different from the animals you have read about in this story.

Sponges have no head or feet. They do not move about, as many other animals do. Sponges fasten onto rocks and other things under the water and stay in one place.

# Animals All

You have been reading about many different kinds of animals.

There are animals so small that you need to look through a magnifying glass to see them well.

There are animals that grow to be one hundred feet long. There are other animals that are more than three times as tall as a man.

There are animals of all sizes in between.

There are animals with many shapes. Some animals look like flowers. Some look like sticks, twigs, or plant stems. One looks like a star. And one looks as if it were covered with sharp pins.

There are land animals and there are water animals.

How different from each other some living things can be! But the different living things you read about in this story are all animals.

## Do You Remember ?

1. Can you name four animals larger than a sheep ?
2. Can you name four animals smaller than a hummingbird ?
3. What animal can change its shape ?
4. Name three animals in the story which have sharp stickers.
5. Which animal in the story is the largest ?
6. Which animal is the tallest ?
7. Name three animals in the story which live in the water.
8. In what way are all these living things the same ?

## Something to Do

1. Look at the list of animals that you made after you read page 7.

How many animals on your list are large animals ?

How many of them are small animals ?

Do any of them have strange shapes ?

2. Make pictures of the different animals that you have learned about in this story.

3. What strange-looking animals can you see near your home ?

# How Animals Get Food



## Many Ways to Get Food

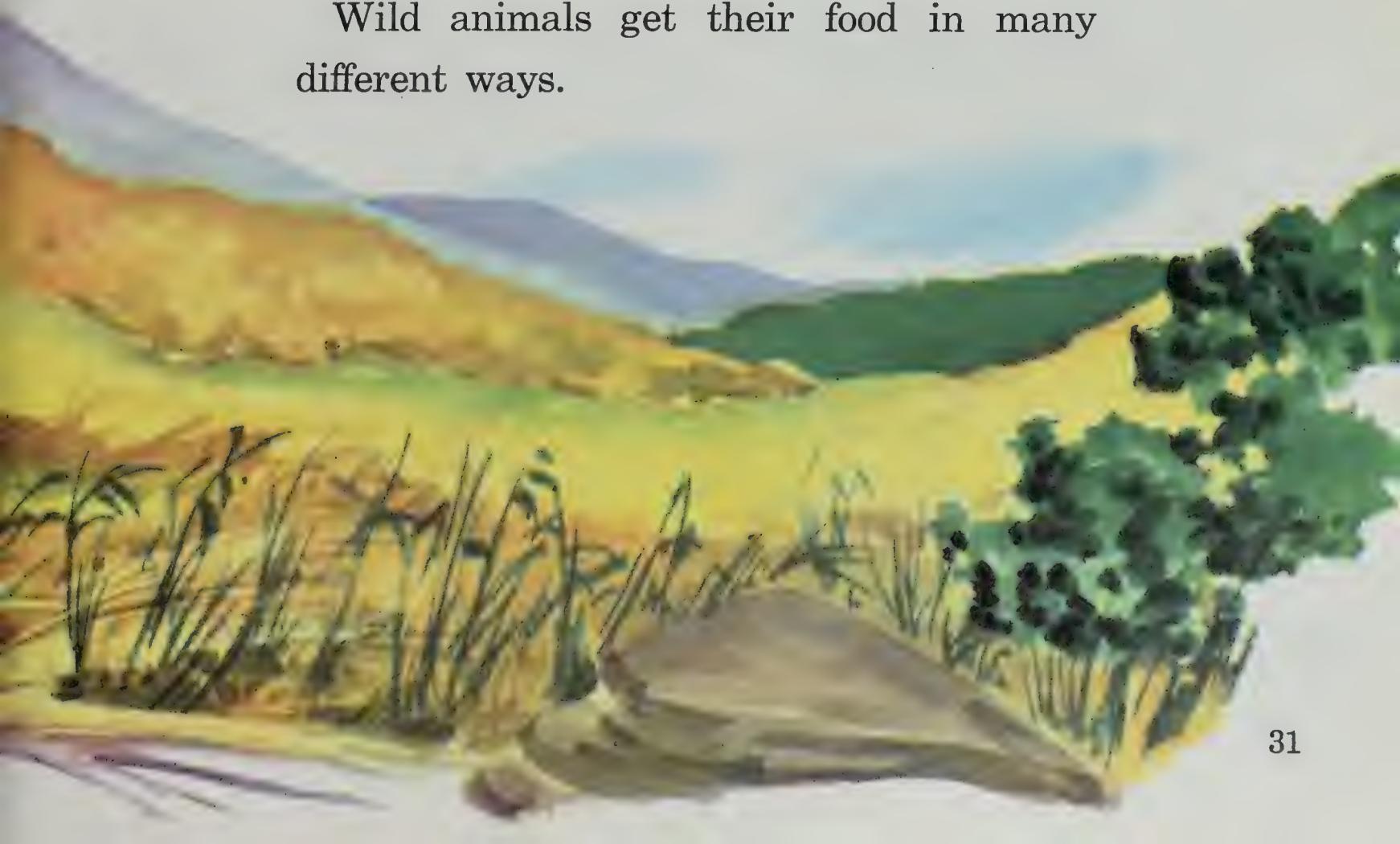
When you are hungry, you may ask Mother for an apple or a cookie. If it is near mealtime, you may smell all the good smells of food.

It is easy for you to get food. You do not need to hunt for it, as most animals do. Mother and Father get the food you need.

If you have a dog or cat, you take good care of it. You see that it gets enough to eat. Your pet does not need to hunt for its food.

Wild animals need food, too. They have no one to feed them. They must find food for themselves.

Wild animals get their food in many different ways.





Some animals get their food as they fly through the air. Can you think of any animals that get their food in this way? What do you think the food might be?

Look at the picture. It may help you to find out.

The birds in the picture are barn swallows. They fly through the air with their mouths open. As the birds fly, they catch the small insects that are flying in the air, too.

A barn swallow can fly fast. It can fly this way and that, — up and down, — so that it can catch insects.

There are other animals which get their food in much the same way. Can you think of one?

You may think that this is a strange way to eat. You would soon grow hungry if you had to go after your food in this way. But a barn swallow is well suited to getting its food as it flies.

Wolves and coyotes can run fast. Wolves and coyotes go after their food quickly, just as the barn swallows do. But wolves and coyotes travel on the ground, not through the air like swallows.

Wolves and coyotes run after many animals. Sometimes they can run faster than the animals they want for their food. Do you think the wolf in the picture can run faster than the woodchuck?

What other animals run after their food?





Owls and some other birds use their feet to catch their food. Their feet are very strong, and they have very sharp claws on them.

An owl hunts for its food after the sun goes down. It flies along near the ground, and watches for the small animals which live in the fields and woods.

When an owl sees an animal to eat, down it flies. SWISH ! SWISH ! go its wings.

The strong, sharp feet catch the animal, and the hungry owl soon has its supper.



Did you ever watch some ducks eat ? Here is a picture of some farm ducks on a pond.

It is mealtime. When these ducks are hungry, they can tip upside down in the water. They eat the plants growing under the water.

This way of getting food is very good for ducks such as these.

How do you think an elephant gets its food? It uses its nose. Think of using your nose to get your food!

An elephant's long trunk is its nose. With its trunk an elephant can pull up grass and other plants to eat.

Up comes the grass. Around and under goes the trunk. The elephant opens its mouth. And in goes the grass.

What a help an elephant's trunk is in getting its food!

A pelican is a bird that eats fish. It flies above the water to look for fish.

Sometimes a pelican flies so low that its wings are just above the water. At other times it flies high in the air.

As it flies, the pelican sees a fish in the water below. Straight down it goes into the water with a SPLASH!

This is a wet way to get food, but it suits the pelican very well.





A butterfly gets its food by sucking the sweet nectar from flowers.

A butterfly has a long, long tongue. Its tongue is very much like a thin straw.

To get nectar, a butterfly sits on the plant and puts its long tongue into the flower. Then it sucks the nectar from the flower in much the same way that you suck milk through a straw.

When a butterfly has sucked the nectar, it rolls up its long tongue and flies away to another flower.

Can you see why a butterfly needs to have a tongue that is like a thin straw?

# How Do These Animals Get Food?

Here are some animal pictures. Each of these animals has something to help it to get its food.

Look carefully at each animal. Does its nose, its feet, its claws, its tongue, its teeth, or its mouth help it to get food?

What does each picture tell you about the way the animal gets its food?

You will want to talk about the animals in these pictures with your teacher and the other children in your room.

Then you may want to make pictures to show how each of these animals gets its food.



# How Animals Escape from Enemies



# Some Animals Go Away from Their Enemies

Nearly all animals have some enemies. They escape from their enemies in many different ways.

Some animals escape from their enemies by running away. A deer can sometimes run faster than the wolf or coyote which is running after it. A rabbit can sometimes run faster than a fox. Then running away is a good way to escape.

A frog may escape from an enemy by jumping into the water and swimming away quickly.

Many birds escape from their enemies by flying into the air. They fly away where their enemies cannot reach them.

Woodchucks and chipmunks go into their holes when they know danger is near. Most large enemies cannot follow the woodchucks and chipmunks into their small holes.

Moving off quickly is a good way for some animals to escape from their enemies.



## Another Way to Escape

Some animals look very much like the places in which they live. They are often the same color as many of the things around them. This makes it hard for their enemies to see them.

These animals do not need to run away from their enemies. They just stay very still. Often their enemies may be near and not see them.

A quail is a bird smaller than a chicken. It lives in the high grasses and bushes. A quail has spotted feathers. When it sits very still among the spots of sunlight and shadows in the bushes, you may not see it at all. Very often a quail's enemy does not see it.

You can see from the picture how well a quail's color hides it from its enemies.



A green frog, sitting on a green plant in water that looks green, may escape from its enemies.

The frog's colors are so much like the other colors around it that its enemies may not even see it.



Some garden spiders are brightly colored. These spiders live in webs among brightly colored flowers. The spider's colors and the colors of the flowers are very much alike. This makes the spider hard to see.

As long as it stays in its web among the colored flowers, the spider may escape.

A garden spider could be seen easily on a brown rock or on brown soil.

Look at the two pictures below. In which one can you see the spider more easily?

What do you think might happen to this spider if it stayed on a brown rock or on brown soil for very long?

Is the spider safe here?



## Some Animals Go into Shells

Some animals escape from their enemies in another way. They do not hide. They do not run away. They close themselves inside a hard shell until the danger is over.

In the picture, how does the turtle escape from the dog?



What happened to the turtle's head and feet and tail? Where did they go? Why can't the dog get at the turtle?

Some snails escape from their enemies by going into their shells. Sea animals such as oysters close themselves inside a hard shell to escape from their enemies.

What other animals besides oysters do you know that have shells?



## Some Animals Have Quills

A porcupine's very, very sharp quills help it to escape from its enemies. The quills cover the porcupine's back and tail. They come out of the porcupine's body easily.

When an enemy comes after it, the porcupine turns its back. It puts its nose near a log or a rock. Then it swings its tail back and forth, and all the quills stand up.

If an enemy gets too close, that tail strikes it. Then the quills come out of the porcupine and stick in the enemy. Here is the way a porcupine quill looks through a magnifying glass. The hooks on the end stick into the enemy.

Losing the sharp quills does not hurt a porcupine. It can grow more quills. But the enemy does not like the sharp, sharp quills sticking in it. The quills hurt !



## Some Animals Fight



Animals have many different ways to fight their enemies. Cats use their claws and teeth for fighting. Lions fight with their teeth and claws, too.

Some animals have horns and fight with them. If you have ever been bumped by a goat, you know how well a goat can use its horns.



Hoofs are very useful to some animals. Bison fight with their hoofs, as well as with their horns. Horses fight with their hoofs. A donkey uses its hoofs for fighting, too. Look at the picture to find out how a donkey fights with its hoofs.



These animals fight with a sting. They sting their enemies. What other animals can you name which fight with a sting?

There are other ways in which many animals fight their enemies. Can you think of any other ways of fighting?

# What Is the Best Way to Escape?

Look at the animals in the pictures on this page. Can you tell how each one escapes from its enemies?



Which one do you think would fly away?



Which ones might stay and fight their enemies? How would they fight?



Which animal might escape by just staying very, very still?



Can you find an animal which might escape inside its hard shell?



There are many, many ways for animals to escape. But each animal escapes in the way best suited to it.



# Changes All About You



## Many Real Changes

There are many, many changes going on about us all the time. They are just as wonderful as the changes which happen in stories. But they are real changes. They happen without magic. They happen without a magic stick or a magic sign.

There are changes in the sky. The sky grows darker as night comes. There are changes again in the sky when it is morning, and we see the sun.

There are changes in the weather. Some days are cool, and some are warm. There are cloudy days. Others are sunny. Can you think of other changes in the weather?

The children in your room at school may change. Some may move away. New boys and girls may come into your room.

What other changes do you know about?  
What changes are going on in the picture?

# Evaporating Is a Change



Early one morning Fred went into the garden. He put some water into the birdbath. Many birds flew to the birdbath. The birds drank and drank from it. They splashed about in the water.



The hot summer sun shone all day. It shone down on the garden. It shone on the water in the birdbath. The warm summer wind blew through the garden. It blew over the water in the birdbath.



Late in the afternoon Fred came into the garden again. When he looked at the birdbath, he was surprised to see that it was empty. All the water had disappeared.

Do you know where the water went?

The birds drank some of the water. They splashed some of it on the ground. But most of the water evaporated. It went into the air.

Mary was in her playroom. She was washing the blackboard with a wet sponge. As she rubbed, the sponge made a wet streak.

Mary watched, and the wet streak faded and faded until it was gone. Mary made another streak with the wet sponge. In a very short while this streak faded away, too.

Can you tell what happened to the water that Mary put on the blackboard with the wet sponge? Is this the same thing that happened to the water in Fred's birdbath?



The water evaporated from the birdbath. It disappeared from the blackboard. It went into the air from both the birdbath and the blackboard. This was a real change. It was a change Mary and Fred could see.

Where have you seen water evaporate?  
Where have you seen this real change?

## Rusting Is a Change



David left his skates in the yard one afternoon. That night it rained. The next morning, when he went to get them, there were brownish-red spots on the skates. David picked up his skates. Some of the brownish-red spots rubbed off on his fingers.



He called to his father to come and see what had happened to his skates. "They were shiny when I left them here," he said. "Now they are full of brownish-red spots of rust. Look — the rust rubs off on my fingers."



"Yes, David," said Father. "Some things made of iron will rust in the places where water gets on them. Your skates are made of iron. They got wet in the rain last night. The rain changed some of the iron in your skates to rust."

# What Will Rust?

Things with iron in them rust when they get wet. Other things will not rust in water. You may find out that some things rust and that others do not.

Put water in six glasses and place them on the table. Put these things in the glasses:



Leave the six glasses, without moving them, for two or three days. What will happen to the paper clips? What will happen to the comb and to the pennies?

After two or three days look at the things in each glass. What changes can you see? Which things rusted? Did the paper clips rust? Did the comb rust? Did the pennies rust? Can you tell from this experiment which things have iron in them?



# Freezing and Melting Are Changes



Mother took some ice cubes from the refrigerator. How cold and hard they were! They made a clinkety sound as she dropped them into a pitcher.



Patsy filled the ice-cube pan with water. Then she put the pan into the refrigerator again. "Soon we shall have more ice cubes," she said.



"Yes," said Mother. "We put the water into the ice-cube pan of the refrigerator, and after a few hours we take out ice."



Water gets very cold in the refrigerator. It freezes and gets hard. When water freezes, it changes into ice. This is a real change.

"Water must be cold to change into ice," said Patsy. "It must be so cold that it will freeze."

"But I can make the ice change. I can make it change into water again."

Look at the picture. What is Patsy doing with the ice? What do you think will happen to the ice cubes?



What has happened to the ice cubes in this picture? How have they changed?



"Look," said Patsy. "The ice has melted. It is not cold or hard any more. The ice has changed to water again."

"Away goes the ice. Back comes the water. Melting is a real change."



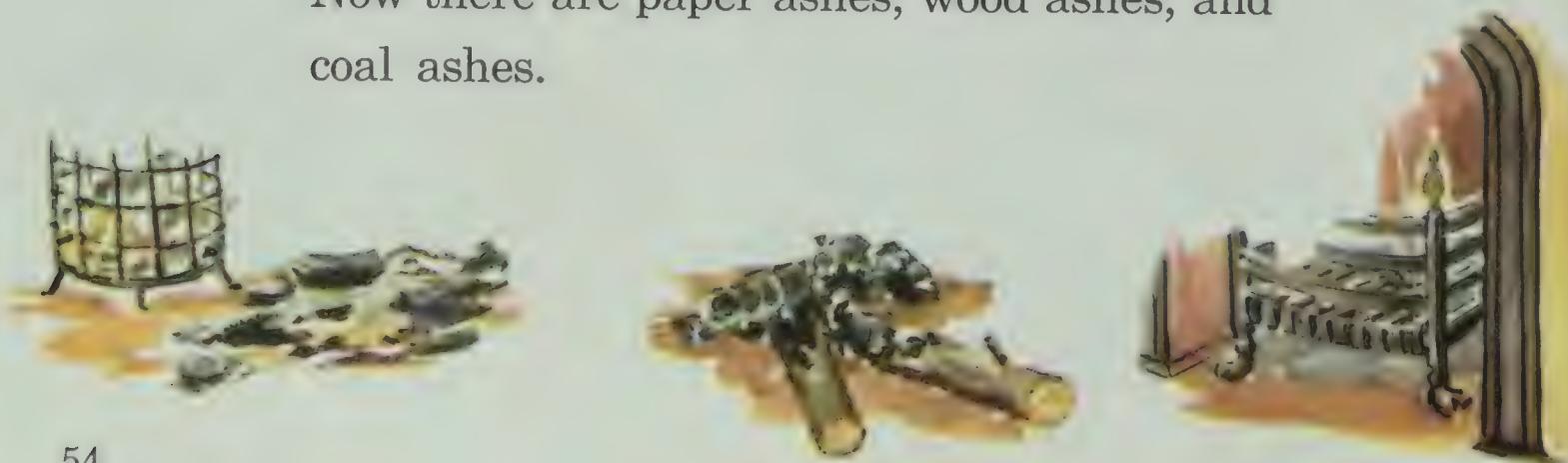
## Burning Is a Change

When some things burn with fire, they change. Papers change when they burn in a paper burner. Wood changes when it burns in a campfire. Coal in a fireplace changes as it burns.



What is left in the paper burner and the campfire and the fireplace after these things have burned? How has the paper changed? What does the wood look like now? What has happened to the coal?

All three things have changed in the way they look and feel. Burning has changed the paper, the wood, and the coal to ashes. Now there are paper ashes, wood ashes, and coal ashes.



# Decaying Is a Change



Andy was in the woods with Father. They were getting humus for the garden.

"There is much plant food in humus," said Father. "Humus is good for a garden."

"What is humus?" asked Andy.

"Take some in your hands and look at it closely," said Father. "You may find out."

What do you find in humus?

Twigs, branches, and small pieces of bark fall from the trees each year. The insects die. They die among the leaves each year. After they die, they decay. The leaves, twigs, and bark decay. They break up into small pieces.

Decaying changes these plants and animals to humus. The humus makes a carpet under the trees in the woods.

# Dissolving Is a Change



Some things change when they are put into water. They go into the water. Then they seem to disappear. This change is called dissolving.



Sugar, salt, and soap dissolve in water. The paint you often use for your pictures dissolves in water.

What other things can you think of which dissolve in water?



Some things will not dissolve in water. But they will dissolve in turpentine.

The paints often used on houses and barns will dissolve in turpentine.

The turpentine dissolves the paint and makes it easy to rub off. You can clean house paint off your hands with turpentine, too.



On this page are pictures of some things which will dissolve. Most will dissolve in water. One of them will not dissolve in water, but will dissolve in turpentine.

# Growing Is a Change

Some changes happen quickly. Ice melts in a warm place. House paint dissolves in turpentine. Wood burns in a campfire. These changes take only a few minutes.

There are other changes, which go on very slowly. Some of the slow changes take years and years and not just a few minutes.

You may not know it, but you are changing, too. You are growing. Growing is a slow change for people. You grow little by little and change as you grow.

How old are you now? You have not always been as old as this. Each day you are a little older. Every year on your birthday you mark that change. Each year on your birthday you put one more candle on your birthday cake.





How tall are you, and how much do you weigh? You have not always been this size. You have not always weighed the same. You grow and change every day.

See how much you have grown by trying to put on your last year's clothes. Do they fit? Where is the change if your clothes do not fit? Is the change in you or in the clothes that do not fit?

These changes may be slow, and they may be small. But they are real changes.



# Animals Grow and Change

A puppy grows up to be a dog.



A kitten grows into a cat.



A tadpole changes into a frog.



All these animals grow faster than you do. They all change as they grow. But a puppy, a kitten, and a tadpole grow and change faster than a person does.

It takes less time for a puppy to grow into a dog, or a kitten to grow into a cat, or a tadpole to grow into a frog, than it takes for you to grow up.

# Plants Change as They Grow

You have seen how animals change as they grow. Plants change, too, as they grow. You may watch these changes in plants as they grow from seeds.

Plant a bean seed in a box of garden soil. Water the seed when the soil is dry. Place the box where it will get some sun each day. Then watch for the changes that take place in the box. Keep a record of these changes.



You will want to find out these things for your record:

1. When did you plant the bean seed ?
2. How many days went by before the new plant came through the soil ?
3. Did your plant bloom ?
4. How long did it take for the plant to bloom ?
5. How long did it take for a bean to grow on your plant ?

In the pictures below are some seeds and the plants that grow from them. The seeds look the way they would if you saw them through a magnifying glass. Try an experiment with seeds like these.

Plant some of the seeds.  
Watch the plants grow and  
change as the bean plant did.

Watch the plants for a month or more to see how they change as they grow. You may find out more about these plants as you watch them grow and change.

Talk about these things with  
the other boys and girls.

1. What kind of plant will a corn seed grow into?
  2. Will one kind of seed grow faster than another?
  3. Will all the seeds grow?
  4. Which will you see on the plant first, the flowers or the new seeds?
  5. Do you know which part of the plant will change to make the seeds?
  6. Will all the plants make seeds?
  7. Will all the plants bloom?



## Changes You Can See

Mike has some tools made of iron. He left them in the grass by the sandbox. How will the tools change if they are left like this for very long ?



Sandy was washing her doll clothes. She left her cake of soap in the water while she put the doll clothes out to dry. How will the soap change if it stays in the water long ?



Jane has finished painting her picture. She closes the paint jars. Why does she do this ? What might happen if she left the jars open ?



Betty has a new pet rabbit. It is just a baby rabbit now. Betty will feed it and take good care of it. How do you think Betty's rabbit will look in six months ? How will it change ?



## Some Things to Try

1. Put some water in two glasses. On the outside of each glass mark with a crayon the place where the water stands. Set one glass on the radiator and one glass on the floor away from the radiator.

Look at the glasses each day for four or five days. Mark the new place where the water comes on each glass. Make this mark with a different-colored crayon every day.

In which glass was the water lower at the end of four or five days? Did the water disappear more quickly from the glass on the radiator than from the glass on the floor away from the radiator?

2. Make a list of all the changes you can think of which happen quickly.

3. Make a list of all the changes you can think of which happen slowly.

4. Try to dissolve these things in water: sugar, salt, sand, house paint, cooking fat, a comb, soap, and garden soil.

5. Try to dissolve the same things in turpentine.

# Using Magnets





## Experimenting with Magnets

It is fun to experiment with magnets. You may have tried to pick up things with magnets as the children in the picture are doing.

A magnet attracts, or pulls, some things to it. Do you know what things a magnet will attract?

One way to find out is to experiment in your schoolroom. Use some of the things the children in the picture are using.

Hold your magnet near each of these things. Which of these things does your magnet attract?

# Magnets Have Different Shapes

In the picture on page 64 the children are experimenting with magnets of different shapes. In the pictures on this page you can see the magnets better.

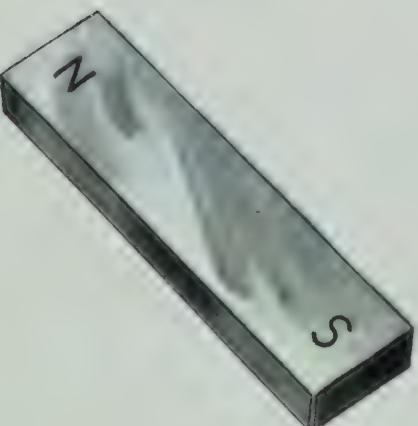
One magnet is shaped like the letter U, and so it is called a U magnet. Another magnet is straight like a bar. It is called a bar magnet. Still another kind of magnet is shaped like a horseshoe. It is a horseshoe magnet.

What kind of magnet do you like to use for experimenting?

Experiment with a bar magnet, a U magnet, and a horseshoe magnet. Does each magnet attract the same things? Does the shape of the magnet have anything to do with what the magnet picks up?

The shape of a magnet has nothing to do with the things it attracts.

A magnet attracts some things, but it does not attract others. A magnet attracts things made of iron or steel. Does it pick up pins? Will it pull string to it? Does it attract paper? The things picked up by your magnet are very likely made of iron or steel.



# A Magnet Has Two Poles



Every magnet has two poles. The poles are at the ends of the magnet. These poles are the holding parts of the magnet.

In the picture above, three magnets are holding steel pins. Which parts of each magnet attract the most pins?

Try with your magnet the experiment which the picture shows. Does your magnet attract steel pins at the poles? Try this experiment with magnets of different shapes.

No matter what the shape of a magnet, it always has two poles. A bar magnet has a pole at each end. A U magnet is just a bar magnet which is bent. It is bent so that the two poles are near each other. In a horseshoe magnet the poles are even closer to each other.

Each pole of a magnet has a name. One is the north pole, the other the south pole. On some magnets these poles are marked.



Take two bar magnets. Hold the north pole of one magnet near the south pole of the other. Can you feel the pull? Hold the magnets closer and closer until they come together.



If the magnets are strong enough, you may hold one magnet in the air with the other. A north pole attracts a south pole, and a south pole attracts a north pole.



Now turn one magnet around. Put the north pole of one magnet near the north pole of the other magnet. Do you feel any pull? Do these two poles hold to each other?



A north pole will not attract another north pole. And a south pole will not attract another south pole.



Two poles which are alike will not attract each other.

Hang up a bar magnet with a very thin string. Hold the south pole of another magnet near the north pole of the hanging magnet. Which way does the hanging magnet move?

When a south pole and a north pole are near each other like this, the hanging magnet is attracted to the magnet in your hand.

A south pole will attract a north pole. And a north pole will attract a south pole.

Now hold the bar magnet near the hanging magnet so that the two north poles are near each other. Does the magnet in your hand attract the hanging magnet or push it away?

What happens when you hold the south poles of the two magnets near each other? Two poles which are alike will not attract each other. The two magnets push each other away.



# Tools That Are Magnets



Iron and steel tools may be made into magnets. When things are made into magnets, we say that they are magnetized.

Scissors may be magnetized. The cutting parts of the scissors are sometimes made into magnets. Then the magnetized scissors attract pins. The pins do not get lost so easily this way. They are attracted to the magnetized scissors.

A tack hammer is another tool that may be magnetized. The iron part of the hammer is made into a magnet. It holds the tack so that you do not need to use your hand. The magnetized hammer holds the tack for you.

These tools are more useful after they are magnetized than they were before.

What magnetized tools have you ever used?

# Making a Magnet

Here is the way Susan made a magnet from a steel knitting needle. First, she wanted to see that the needle was not a magnet. Then she put it into a box of steel pins. It did not attract any pins. The knitting needle was not a magnet.

Susan held the knitting needle in one hand and a magnet in the other hand. She pulled the needle across one pole of the magnet. Each time she was careful to pull the needle across the magnet the same way. Susan did not rub the needle back and forth across the magnet. Again and again Susan pulled the needle across the magnet.

Then Susan put the knitting needle into the box of pins again. This time the needle attracted many pins. It was magnetized.



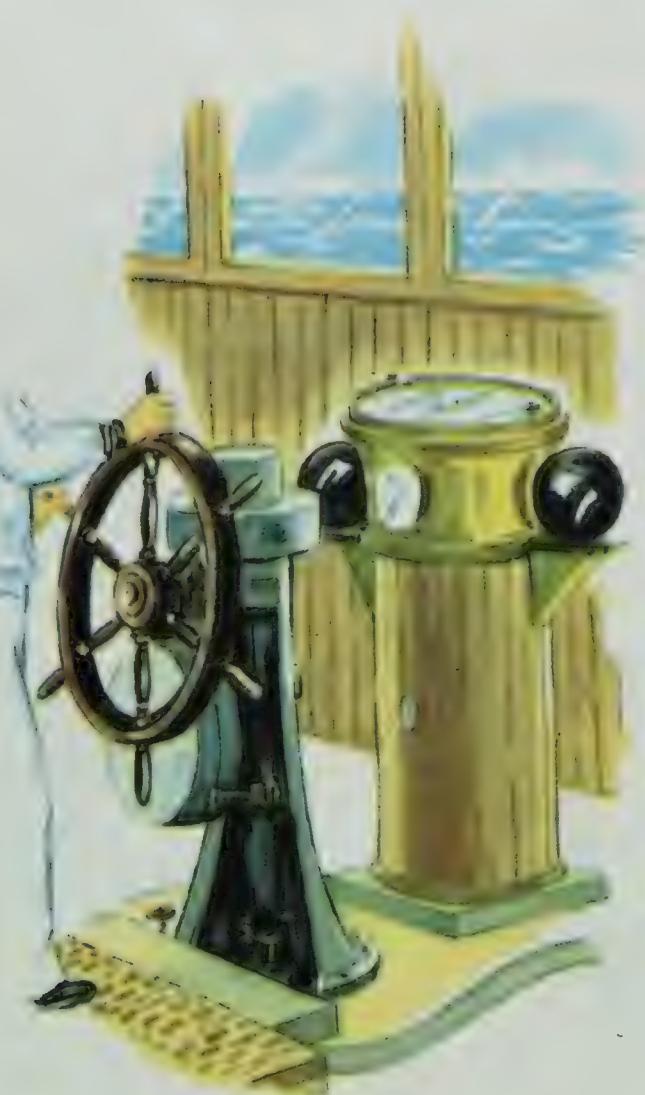
# A Compass Needle Is a Magnet

Many people use compasses.

Men on ships out in the ocean can tell the directions with a compass.

The men who fly airplanes high above the clouds know their directions when they look at the compass in the airplane.

A compass is very useful. People use a compass to help them find their way. Have you ever used a compass?



Here is a picture of a small compass. On the compass there are four letters, N, S, E, and W. These letters stand for four directions.

N means north. S means south. E means east. We see the sun in the east in the morning. W means west. The sun is in the west in the late afternoon.

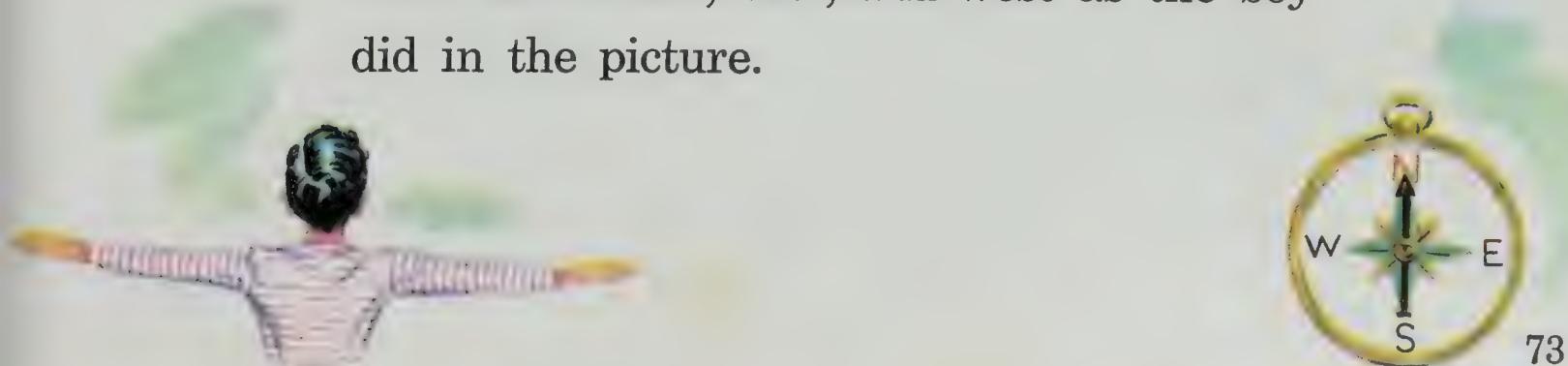
There is a small needle inside the compass, too. This needle moves back and forth. But if the compass is still for a while, the needle stops moving. It points toward the north.

No matter which way the compass is turned, one end of the little needle inside always points to the north. This may not always be toward the letter N on the face of the compass. You must turn the compass to bring the letter N under the point of the needle.

The little needle in the compass is really a small magnet. This magnet can move around. A compass needle moves so that one end always points to the north.

If you know where north is, it is easy to find the other directions. The needle of the compass in the picture is pointing to the north. The boy is facing north. His back is to the south. His right arm points east. And his left arm points west.

Try to find north with your compass. Then find south, east, and west as the boy did in the picture.





Here is a way to show that a compass needle is a magnet and has two poles:

Lay a compass on a table and wait until the needle stops moving. See that there are no magnets near the compass.



Then hold a bar magnet with its south pole near the end of the compass needle which points north. Is the needle attracted by the magnet?



Hold the north pole of the bar magnet near the south-pointing end of the compass needle. See how the needle swings toward the magnet.

Two different poles attract each other.



Hold the north pole of a bar magnet near the end of the compass needle which points north. Which way does the needle swing?

Put the south pole of the magnet near the south-pointing end of the compass needle. The needle swings away from the magnet. Two poles which are alike move away from each other.

The compass needle is a magnet and has two poles.

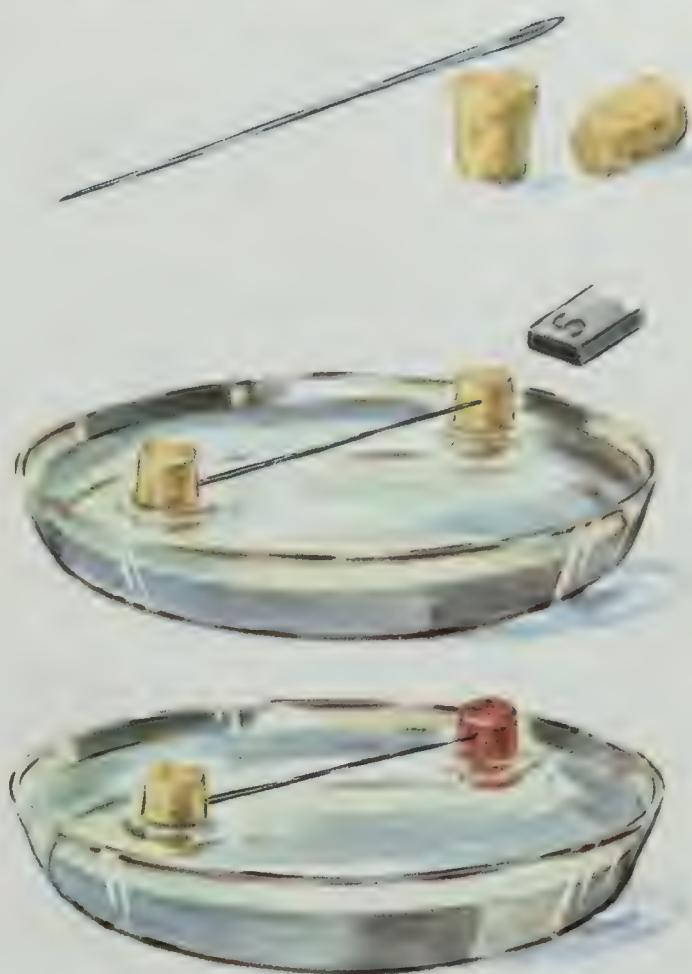
## Two Experiments for You

1. You can make a homemade compass. You magnetize a large needle first. Then stick a very small cork on each end of the needle. Float the needle and corks in a glass dish of water.

Now use a magnet to find the north- and south-pointing ends of the needle. The north-pointing end of the needle can be marked by painting the cork at that end.

2. You can make a nail act like a magnet by just holding it with a magnet. As you hold the nail with the magnet, put the nail into a pile of pins. It acts as a magnet.

Now take the magnet away from the nail. What happens to the pins? The nail acts as a magnet only while the magnet is holding it. When the magnet is taken away, the nail does not attract the pins. It no longer acts like a magnet.



# Using Electricity



# Experimenting with a Dry Cell

Jack and Jerry are going to put a light in Jean's dollhouse. They have a dry cell, two pieces of wire, and a little light bulb in a small socket.

"I can make the bulb light," said Jack.

Jack took the dry cell, one wire, and the light bulb. The picture shows how he hooked them together. Do you think the bulb will light? Tell why.

"The bulb does not light," Jean said.

"You can see why," said Jerry. "Electricity must get from the dry cell to the light bulb and back to the dry cell again. It cannot do this on the pathway you made. You need the other piece of wire in your electric pathway."

Can you find the place where the other piece of wire should go so that the bulb will light?





Jerry took the other wire.

" You must make a complete pathway for the electricity. To do this, you need two wires," he said. " I will hook this end of the wire under the outside screw on the dry cell. Then I will hook the other end to the screw on the light socket. Do you see why two wires are needed to make a complete pathway ? "

" Yes," said Jack. " The dry cell has two screws. My wire is hooked to just the middle one. Your wire is hooked to the outside one."

" The two screws are the binding posts," said Jerry. " A dry cell has two binding posts. We have hooked a wire to each one."

" The bulb lights ! " said Jean. " The wires, a dry cell, and a light bulb have made a pathway for electricity."

In the picture show with your finger the complete pathway along which the electricity travels.



# Turn It Off—Turn It On

The little light burned brightly.

"How can I turn off the light?" asked Jean.

"That's easy," said Jack. "Just take the bulb out. Then the electricity does not reach the bulb to light it."

"You can take a wire from a binding post or from the light socket," said Jerry. "Then the electricity cannot get from the dry cell to the light bulb."

Just then Father came in.

"I know another way to keep electricity from getting to the light bulb," he said. "Only one wire is hooked. I will cut the wire that is not hooked."

Father cut the wire.

Then he hooked the end of this wire to the dry cell. Still the light did not go on. Father had cut the wire.

"Now I will show you how to make the light go on again," said Father.





Then Father held the two ends of the cut wire together. The light came on again.

"You see you must hold the wires together to make the light come on," Father said. "When the wires do not come together, the light goes off. The pathway is not complete when the wires do not come together."



Then Father said, "A better way to turn the light off and on is to use a switch. When you use a switch, you do not need to hold the wires together."



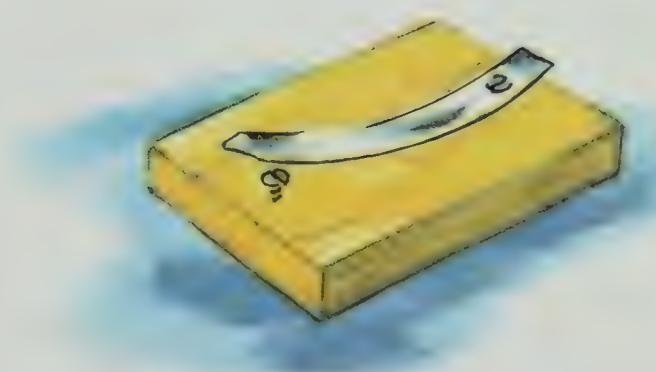
"A switch works the same way for this little light as it does for the lights in the house. We can make a switch right here for this light. We shall need a small block of wood, two screws, and a piece of tin cut from a tin can."

Father made a list on a piece of paper. Jack and Jerry took the list. Soon they were back with the things Father needed to make the switch.

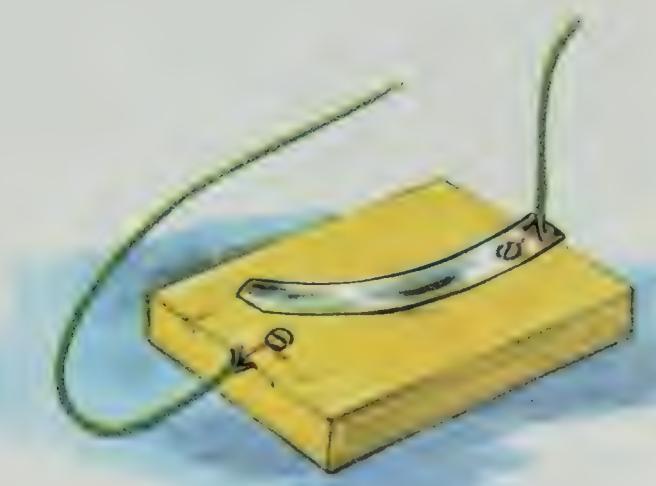
Father made two holes in the block of wood, one near each end. He made a hole in one end of the piece of tin can. Then he bent the piece of tin can a little.



Next he fastened the piece of tin can to the wooden block with a screw. He put the screw into one of the holes in the block. Then he put a second screw into the hole at the other end of the block.



Father took the two ends of the cut wire. He hooked one end under the second screw. He hooked the other end under the first screw, between that screw and the piece of tin can.





"The switch doesn't work," said Jean. "The light did not go on."

"Is the pathway complete?" asked Jack.

Then Father said, "No, the pathway is not complete. The switch is open. I will close the switch. Then the pathway will be complete. The electricity can travel from the dry cell, through the wire, and through the switch, to the light bulb and back again to the dry cell. When the pathway is complete, the bulb lights."



"With a switch you can make a complete pathway for electricity. Or you can break the pathway. Then the electricity stops at the switch."

"Open the switch. Off goes the light!"

"Close the switch. On comes the light! A switch is useful in an electric pathway."

# Be Safe with Switches

Did you ever stop to think how useful switches are? You use them many times each day, often without thinking about it. You can turn a switch and use electricity when you need it. A switch makes it safe for you to use electricity.

You turn on lights with a switch.

You turn on the radio and the television set with a switch.

You use switches to turn on the vacuum cleaner, the electric iron, the electric toaster, the electric stove, and other things about the house.

When someone rings your doorbell, he is using a switch.

How many, many places switches are used!



When you do not need to use electricity, you can turn it off. The safe way to turn off electricity is to use a switch.

How noisy it would be if you could not turn electricity off, as well as on! The radio would play all the time. The vacuum cleaner would buzz without stopping. The television set would stay on. The doorbell would keep on ringing.

Your house would not be safe without switches. The electric iron would become hotter and hotter. All the lights in the house would get hot, too. They would be on day and night. Your toast would burn up in the toaster. The electric stove would be too hot to use, and there would be great danger of a fire.

With switches your home is a safe place.

You can turn off the lights with a switch.

You can turn off the radio with a switch.

With switches you can turn off the television set, the radio, the vacuum cleaner, the iron, the toaster, and the stove.

Switches make it safe for you to use electricity.

## Something to Find Out

1. Make large pictures of some of the things that you turn on with a switch.
2. Write a list of all the switches you use in your home. Find out how many switches Mother uses.
3. Make a complete pathway for electricity with a dry cell, wires, and a light. Then cut the wire as if you were going to put a switch in the pathway. Put different things across the break in the pathway.

Try such things as scissors, string, a paper clip, and anything else you wish. When the pathway is complete, the bulb will light. What things make a good pathway for electricity?

4. You can make some large pictures to show where electricity travels. Make one picture to show how electricity travels with a dry cell, wires, and a light. Make a second picture to show how electricity travels with a dry cell, wires, a light, and a switch.

# The Air Around You





## Living in an Ocean of Air

You may be surprised to know that you are living at the bottom of an ocean ! It is not an ocean of water. It is an ocean of air. This air ocean is all around the earth. It is a part of the earth.

This air ocean is much, much deeper than the oceans of water. Some scientists say that there is some air as high above the earth as five hundred miles. Think of an ocean of air five hundred miles deep ! And you are living on the bottom of that ocean of air.

Air is all around you. Air gets into your eyes and ears. When you open your mouth to eat, air goes in with the food. You breathe air all the time. You walk through air whenever you move. There is air around you everywhere. You need air to live. Your body is made for a life in the air.

## Air in Many Places



There is air in soil. The little spaces between tiny pieces of rocks and twigs in soil are filled with air. You can find out about the air in soil by trying this experiment:

Put some dry garden soil into a tin can or jar. Then pour water on the soil. The first and second pictures will show you what to do.

In the last picture you can see air bubbles floating on the water.

When you pour water on the soil, the spaces fill with water. The air that was in these spaces is pushed out. Then you see the air come to the top of the water as bubbles.

Sometimes the water does not go into the soil quickly. Can you think why this might happen? Remember that there is air in the soil. The water cannot get in until the air comes out.

There is air in water. Did you know there is space in water for air? Here is a way to see that air comes out of water:

Put some water in a pan. Set the pan on a stove and then turn on the heat. Watch to see what happens.

As the water gets warm you can see bubbles in the water. The water gets warmer. There are more and more bubbles on the sides and bottom of the pan. A bubble comes to the top of the water and breaks. Another comes to the top, and another. Air is coming out of the water in these bubbles.



The air in water is used by plants and animals which live in water. Fish breathe the air in water. Fish could not live in water if it had no air in it for them to breathe. Water plants use the air in water as they grow.



Did you know that there is air even in some rocks? Pumice is a rock with air in it. Pumice is a light rock. There are many holes in a piece of pumice. What do you think is in these holes?

When you hold a piece of pumice under water, many bubbles come to the top of the water from the rock. They are air bubbles. As the water goes into the holes in the pumice, the air comes out.



A sponge has air in it. Hold a sponge down in a pan of water. Watch the bubbles come out of it. Squeeze the sponge. Squeeze it while it is under the water. What is in the bubbles that come out of the sponge as you squeeze it?

Air fills many spaces all about us. Air fills the spaces in soil and it fills the spaces in water. It fills the spaces in some rocks and in sponges. Can you think of other spaces that air fills? There is air in many spaces.

# Air Makes Things Float

There is enough air in some rocks to make them float. The air in a piece of pumice will make it float.

A sponge has air in it. Put a sponge in a dish of water. Will it float? How long?

As long as air fills the spaces in a sponge, it will float. As some of the air comes out and the water goes into the spaces, the sponge sinks lower in the water. Will the sponge sink to the bottom of the dish? Can you tell why?

Place a balloon in a dish of water as the boy in the picture is doing. Does the balloon float?

Now blow up the balloon and close the opening. Then put the blown-up balloon in the water again. Will it float? Tell why.

The air which is in some things makes them float.



# Air Is Made of Gases

The air around you is made of many gases. Your body uses some of the gases in the air. Plants use some of the gases, too. Land animals and water animals use some of the gases in the air as they live and grow.

Oxygen is one of the gases in the air. It is a very important gas. It is important because living things need oxygen. You need oxygen to live. Water animals get the oxygen they need from the air which is in the water. Many plants use oxygen as they grow.

Water vapor is one of the gases in the air. When water evaporates, it changes into a gas called water vapor. The air may be filled with water vapor, but you cannot see it.

There are other gases in the air, too. You may have heard of some of them.



## Water Goes into the Air



Some water is going into the air all the time. When water goes into the air, it changes into water vapor. You do not see the water vapor in the air, but it is there just the same.



Water goes into the air from the oceans and the rivers. Water evaporates from the lakes and ponds. When puddles dry up, much of that water goes into the air. Water evaporates from the soil. It evaporates from the streets and sidewalks after a rain. It evaporates from the aquarium in your schoolroom.



Water goes into the air from the leaves and stems of plants. You breathe some water into the air. When you water the garden with a sprinkler, some of the water evaporates before it reaches the ground.



Water goes into the air from many places.



## Water Comes from the Air

You have read about the ways in which water goes into the air. Sometimes the air becomes so full of water that it can hold no more. Then water comes out of the air.

The clouds you see in the sky are water in the air. Clouds are made of many tiny drops of water. As more water goes into the air, the tiny drops start to grow.

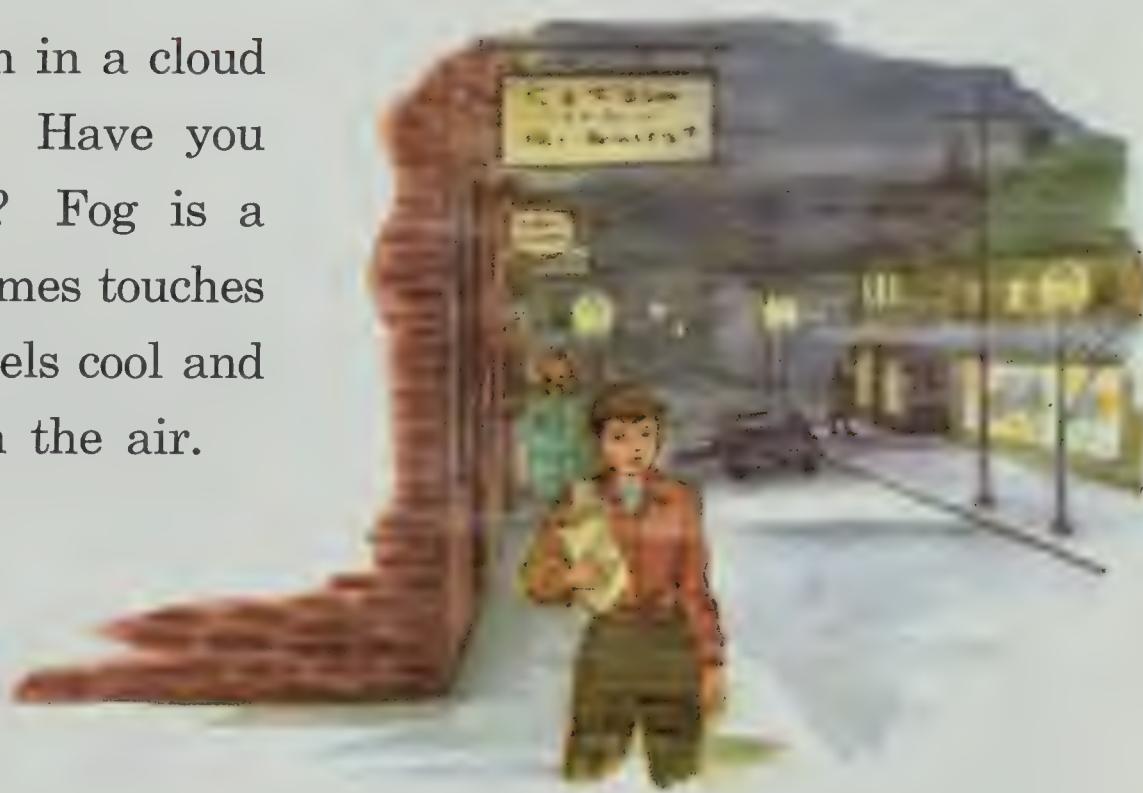
The more water that goes into the air, the larger the drops of water become. Soon the cloud is made of big, heavy drops of water.

After a while the drops of water get so heavy that they fall from the cloud. Down, down they fall to the earth. When that happens, water comes from the air as rain.

If the air is cold enough, the water in the cloud freezes. Then snow may fall to the earth. Sometimes the snow covers the ground and trees until everything looks white.



You may have been in a cloud without knowing it. Have you ever been in a fog? Fog is a low cloud that sometimes touches the earth. The fog feels cool and wet. Fog is water in the air.



You see water in the air as clouds. Water comes out of the air as fog. Water comes out of the air as rain. Water comes out of the air as snow. You can see that water comes out of the air in many ways.

## Do You Remember?

Water moves into and out of the air.

Water evaporates into the air from lakes and ponds.

It goes into the air from the ground after a rain.

Some water goes into the air as you breathe.

Water comes out of the air, too.

It comes out of the air as rain or snow.

It comes out of the air as fog.

Look at the picture to find how water moves into and out of the air.

## Some Things to Try

1. Set a glass of water aside on a table. Do not move it for three or four hours. Then look at it. What do you see on the inside of the glass now? The little bubbles that you see are air bubbles in the water.
2. Fill a tin cup with cold water. Put ice into the cup if you have some. Dry the outside of the cup very well. What can you see on the outside of the cup? Does the cup leak? Where did the water come from?
3. Put each of these things into a pan of water. Find out which ones will float. Can you tell which ones have much air in them?

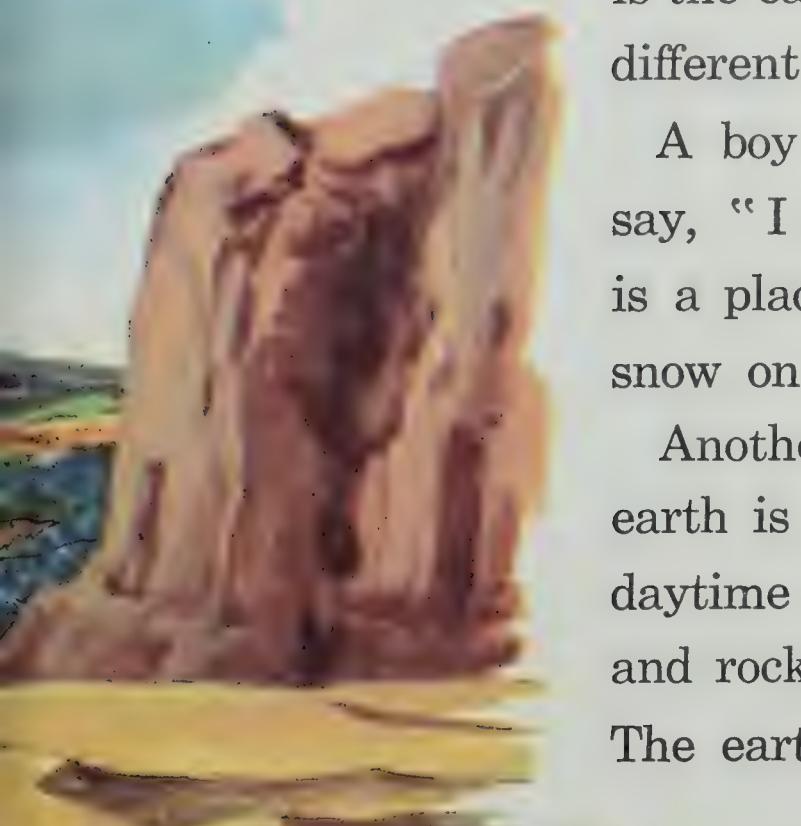
a block of wood  
a marble  
a crayon  
a sponge  
a piece of pumice

a tin cup  
a pebble  
a paper clip  
a tack  
a penny

# The Earth You Live On



## What the Earth Is Like



If you ask other boys and girls, "What is the earth like?" they will tell you many different things.

A boy who lives in the mountains may say, "I know what the earth is like. It is a place with high mountains. There is snow on some of them all the year."



Another boy or a girl may tell you, "The earth is a big, dry place. It is hot in the daytime and cool at night. It is sandy and rocky, and there are only a few trees. The earth is like a desert."

Some children may tell you that the earth is a forest with many big trees. They may tell you of the many small green plants which grow in the cool shade of the tall trees.

Nearly every boy and girl who reads this book thinks differently about what the earth is like.

Tell what you think the earth is like.



To some girls and boys the earth may seem like many big farms with fields of corn or wheat. Still others may say that the earth seems to be miles and miles of rolling, grassy hills with no trees at all.



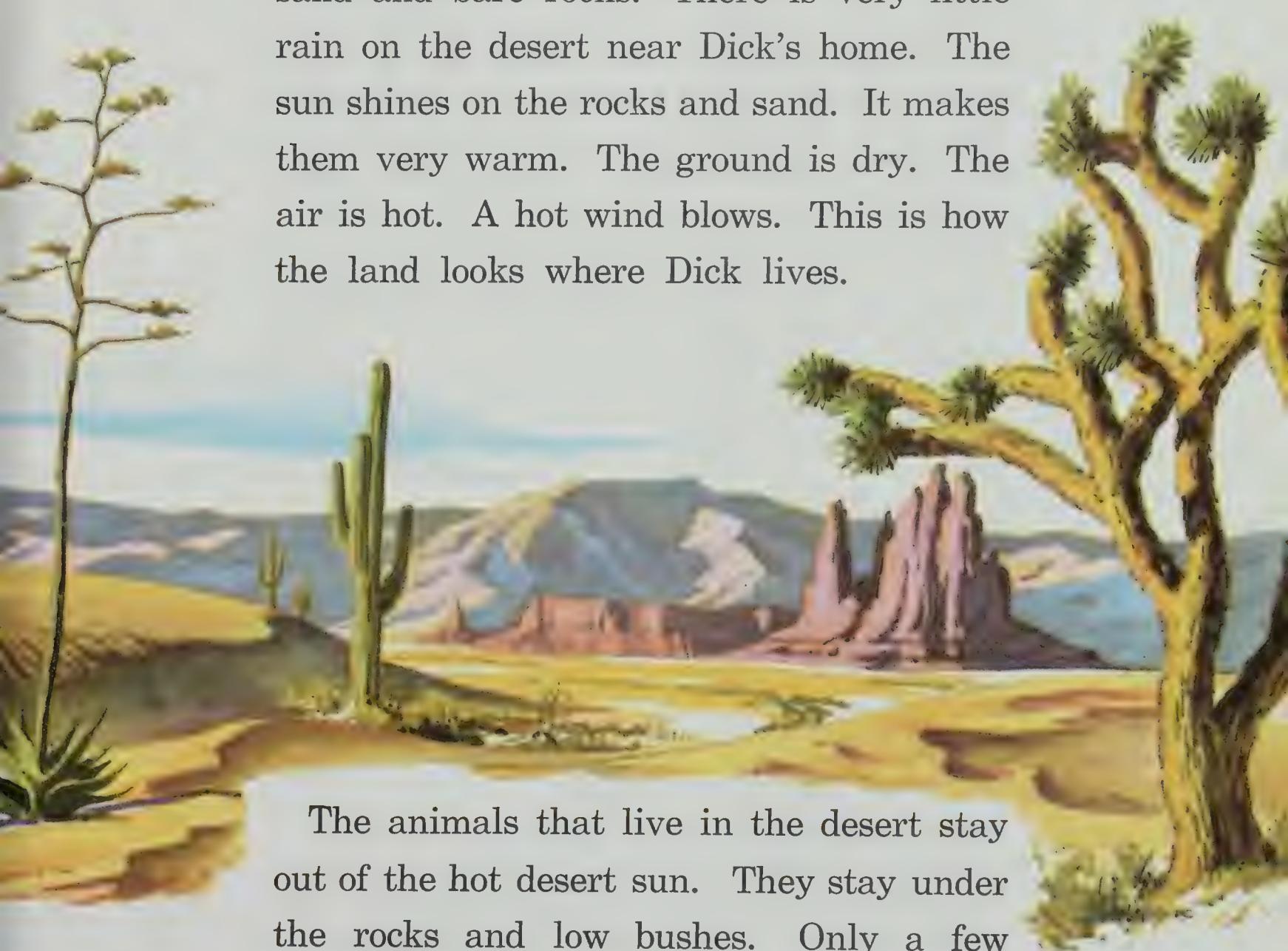
A girl who lives by the ocean may say, "The earth is like a long, sandy beach with rocks along it. The ocean splashes up on the beach. The waves make a loud roar and swish as they come and go on the beach."

There are many parts of the earth. Hills and mountains are part of the earth. Fields and forests are part of the earth. Oceans and beaches and deserts are part of the earth.

This big, round earth is all these things. How does the earth look where you live?

# The Land You Live On

The picture below shows you how the land looks where Dick lives. His home is very near a desert. From his house near the desert he can see miles and miles of sand and bare rocks. There is very little rain on the desert near Dick's home. The sun shines on the rocks and sand. It makes them very warm. The ground is dry. The air is hot. A hot wind blows. This is how the land looks where Dick lives.



The animals that live in the desert stay out of the hot desert sun. They stay under the rocks and low bushes. Only a few kinds of plants can grow in the desert. These plants can grow with very little water.

The desert near Dick's home is a hot, dry place.



Jean's home is in a forest. All around her house there are big trees. They reach up, up for one hundred feet or more. Some of them are almost as big around as Jean's house.

The ocean is not far from Jean's home. She can hear the sound of the waves. When the wind blows from the ocean, it often brings fog with it. The fog makes everything feel very damp. The ground is damp. The air is damp.

How is the land near your home different from this?

How is the land where Jean lives different from the land around Dick's home, near the desert?

Bill lives where there are many high mountains. Some of them are bare and rocky. On other mountains near his home there are forests of evergreen trees. Still others are so high that some of the snow which falls on them in the winter stays all the year.

A mountain stream runs by Bill's house. The water comes from the melting snow away up on the mountainside.

In the summer there are many wild flowers in Bill's yard. In the winter everything is covered with deep, white snow.

Is your home in the mountains? Can you find rocky hillsides and mountain streams where you live?





Ben lives on an island. Here is the way the land looks around his home. What can you see all around his home?

If Ben wanted to get off the island, how do you think he would travel? How would you get to the island to visit Ben?



Jane's home is on the plains. The rolling land goes on and on as far as you can see. The land here is covered with grasses. There are very few trees.

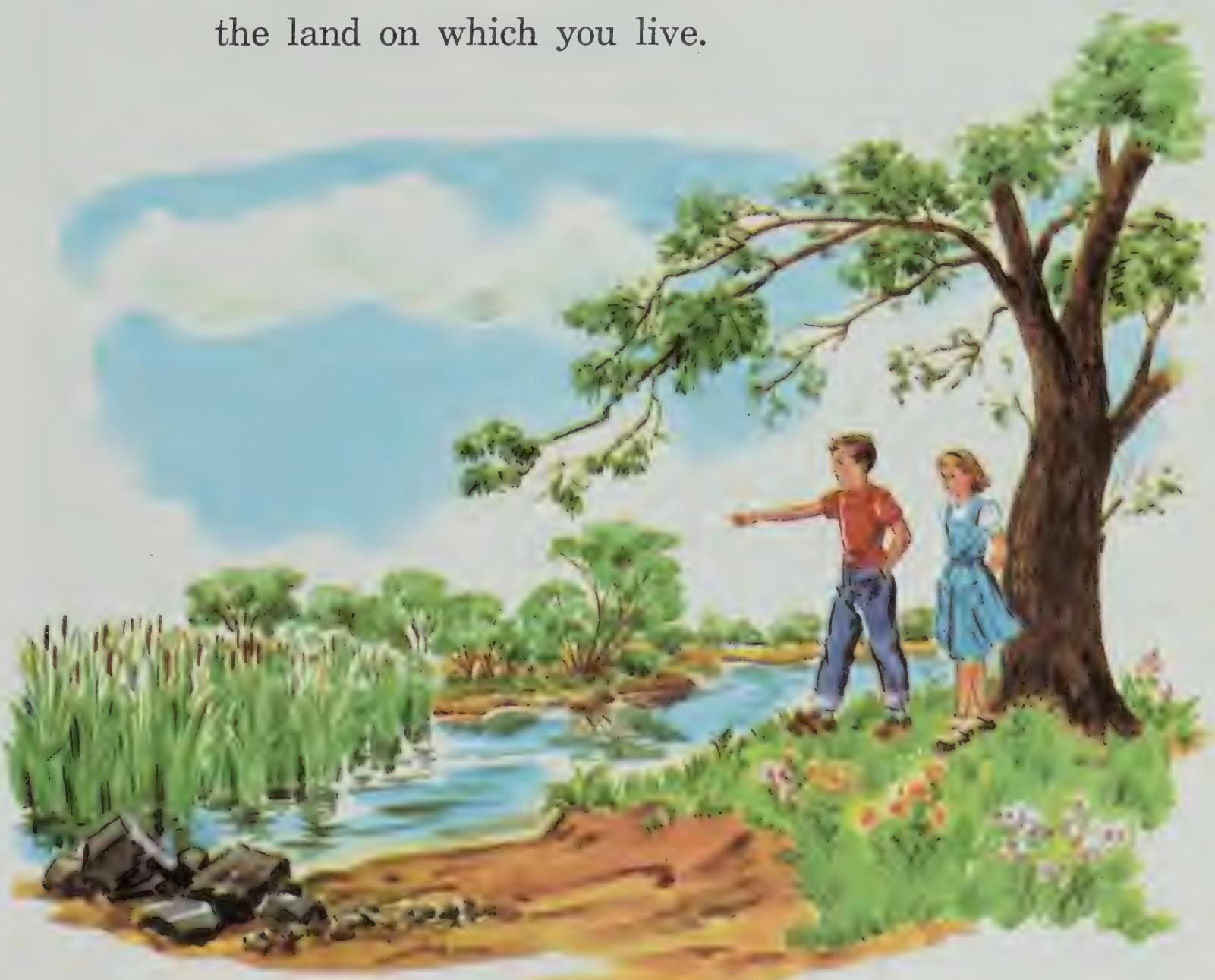
Jane's house is far from other houses. Her house is far from a town. The plains are very big. Do you know anyone who lives on the plains?

You know best about the part of the land where you live. Look at the land around your home. What is it like?

Even in your town or on your farm, not all the land looks the same. There may not be big differences, but there are likely to be some differences that you can see.

There may be high places and low places, wet places and dry places, bare rocky places, and places where many plants grow.

Try to find some of these differences in the land on which you live.



# Places to See on the Earth



Some places on the earth are very strange and wonderful to see. Many of these places are set aside as parks. If you wish, you may visit the parks and see the different and interesting sights.

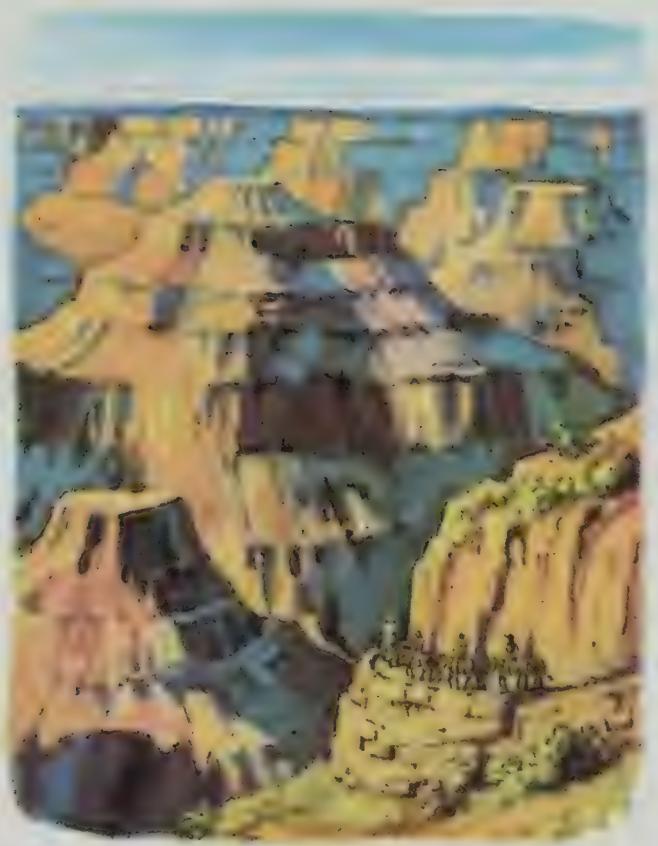
When you visit a park, you may look at all the wonderful sights. But no one takes things from a park. No one picks the flowers or the other plants which grow in the park.

In the parks there are people who will tell you about the interesting things there are to see and do. They will tell you all about the wonderful sights there are to see. They will tell you about different things in each park, such as the birds and other animals, the flowers, trees, and the waterfalls.

You may have taken a trip to a park. Your home may be near a park.



You will find all these interesting parts of the earth in parks. Have you ever seen any of these places? Do you know where any of them are?





## The Big Earth

Have you ever stood on the top of a high hill or been up in a tall building?

When you are high above the earth and look about you, you feel as if you were on top of the world. You can look in every direction. The clouds sail by above you. The earth spreads out for miles around you.

You may see hills, trees, valleys, and rivers. The hills, trees, valleys, and rivers may spread out for miles all around you.

You may look far, far out over the ocean. The ocean may spread out for miles around you.



You may see animals feeding in fields.  
You may see farms in the valleys, or  
towns with houses and stores.

You may see your own house or your  
school.

All the things you see look small because  
they are far away from you. Something  
as big as a barn or a ship looks very small  
when you are far away from it.

How big the earth is! It goes on and  
on in every direction. You may say, "I can  
see the whole earth from the top of this  
hill." It may seem as if you could see the  
whole earth, but you are really looking at  
a very small part of it. No one has ever  
seen the whole earth at one time. It is  
much, much too big for that.



# Traveling on the Big Earth

There are many places to go on this big earth. Where have you gone? What have you seen?

Have you ever been to the mountains?

Have you been to a lake?

Have you ever traveled through forests?

Where did your trip start? Where did it end?

Show the class your trip on a map.

There are many ways to travel on the big earth. When you travel over the solid part of the earth, you may go by car or bus or train.

Ships and boats travel on the waters of the earth.

Airplanes fly high in the air above the earth. If you want to travel very fast, you may go by airplane. An airplane travels much faster than a car or train or ship.



Do you know someone who may have been across the ocean by plane or boat? Can you find the Atlantic Ocean on the globe? Can you find the Pacific Ocean? You can fly across the oceans in an airplane, or you can travel across them in a big ship.



Do you know anyone who has been all the way around the earth? It takes a long time if you go by boat. You can go around the earth much faster in an airplane.



One way of traveling is to take make-believe trips with a globe. You may go anywhere on the earth. Take a make-believe trip across the Atlantic Ocean. Take a trip that is make-believe across the Pacific Ocean. How will you travel?

# Learning More About the Earth

A globe is like a little earth.  
It is round like the earth. On a  
globe you can find the land and  
water parts of the earth.



You can find oceans on a globe.  
You can find countries on many  
globes. You can see how round  
the earth is by looking at a globe.  
You can learn many things  
about the earth from a globe.

Find the place where you live on the globe. Put a paper flag there to mark the spot. The paper flag will mark the spot where you will start your make-believe trip around the earth. You may travel north and south around the earth. Or you may go east and west around the earth.



Walk all the way around the globe on your make-believe trip. As you walk, move your finger around the globe to show where you are traveling. Go all the way around the globe and come back to the flag which marks your home.

Did your finger touch any of the blue parts of the globe? The blue parts show where there is water on the earth. Each time you touch a blue place, you are crossing water. How might you travel across the wet parts of the earth?



The brown parts of this globe show the land parts of the earth. Did you cross any land on your trip? Can you name three ways to travel across the land?



On your trip around the earth, did you cross any mountains? You can use a globe to find out many interesting things about the big, round earth.

# Some Things to Think About and Talk About

What differences in the land can you see from your schoolroom window?

Does the land around your house look just like the land where your best friend lives?

Is the land bare and hot and dry where you live, or is it covered with many green plants and tall trees?

Do the rocks stick out of the ground near your home or schoolhouse?

Do you go uphill or downhill to go to school?

Which do you put on more often, a big hat to keep off the hot sun or your raincoat to keep off the rain?

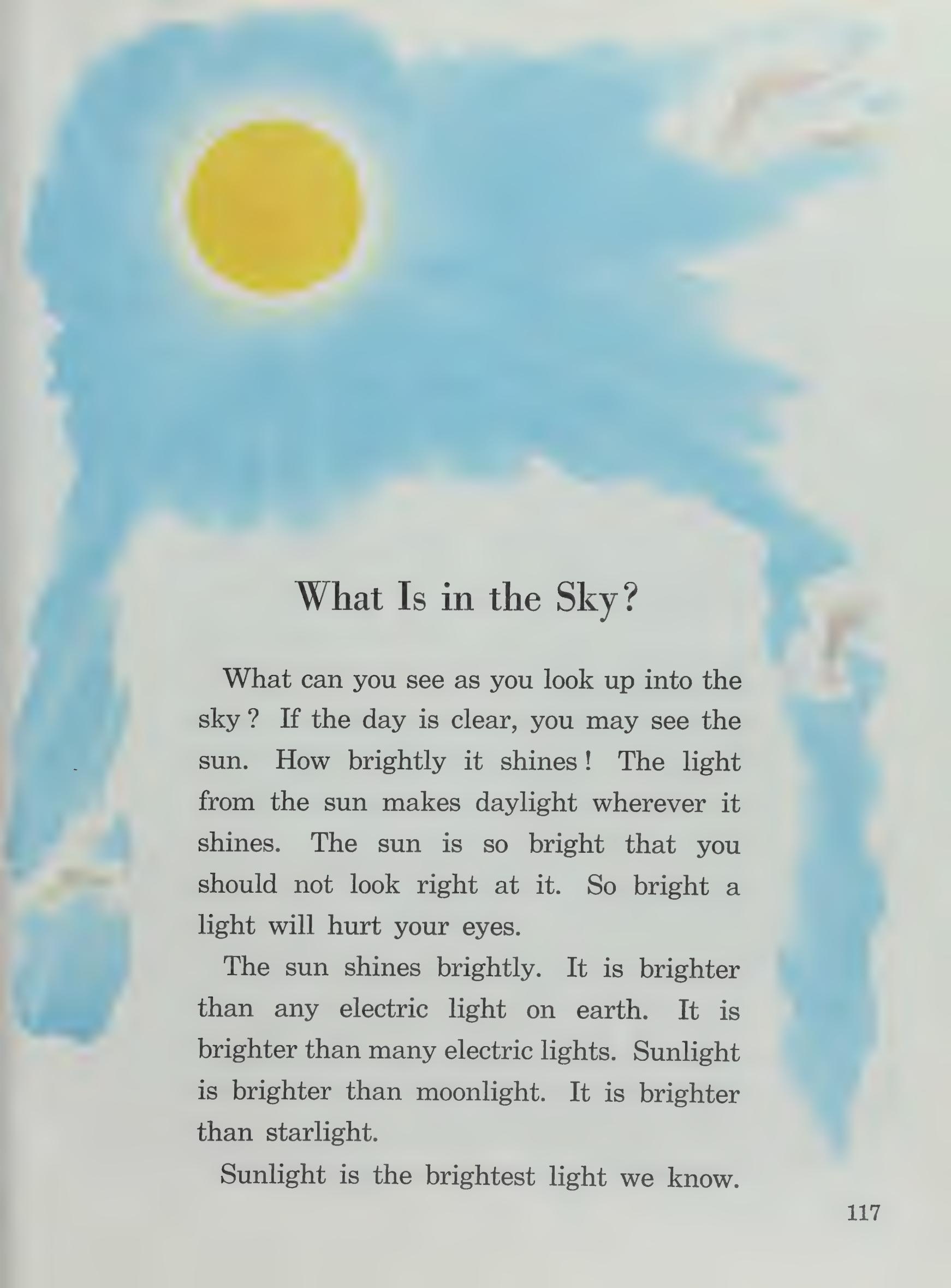
Do you go across water to get from your home to the city?

Where do you have your picnics — in the woods, by a lake, on a mountainside, or at the seashore?

Have you visited any parks like the ones shown in the pictures in this story? If you have, perhaps you can tell the boys and girls in your class something interesting about your trip.

# The Sky Above You



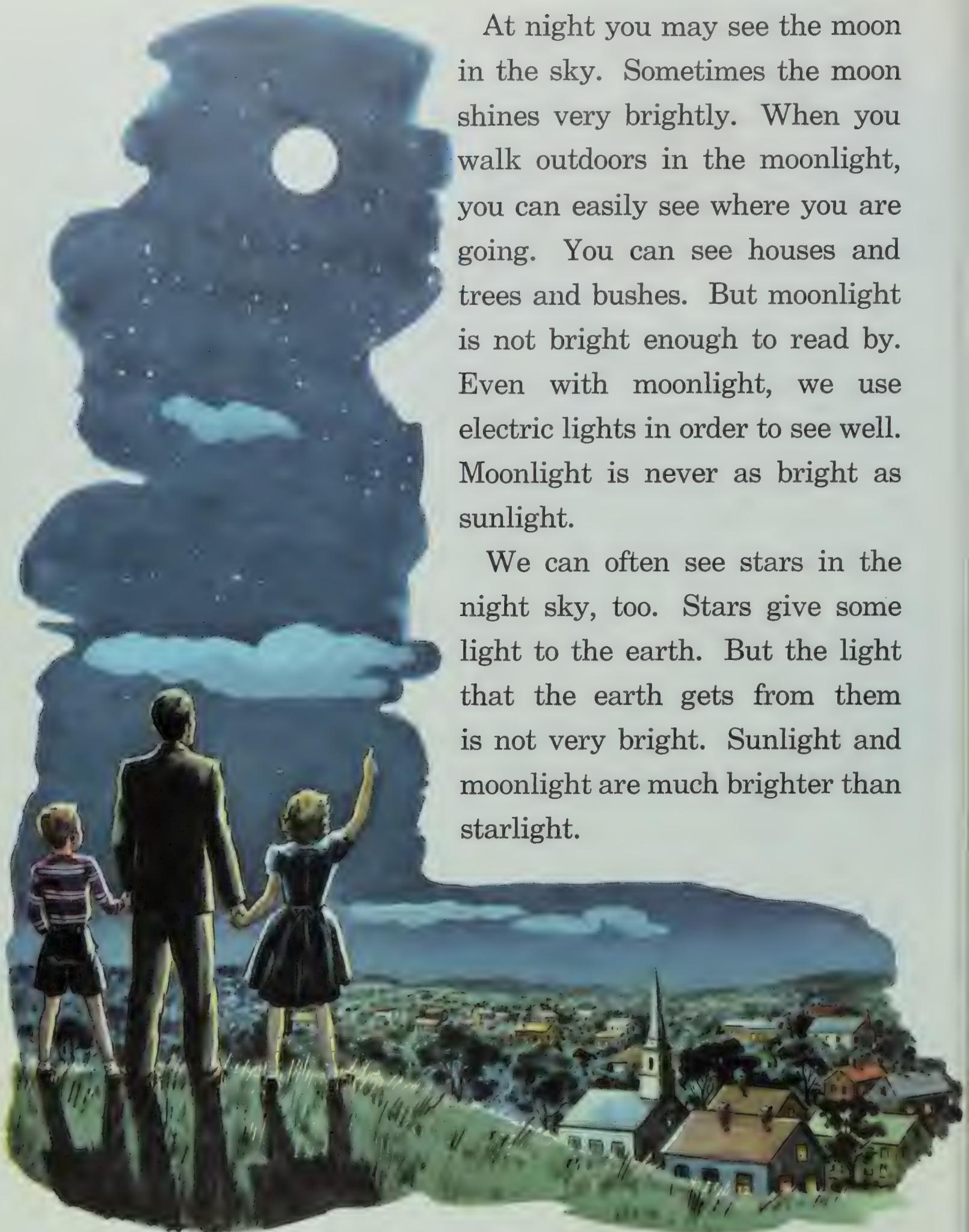


## What Is in the Sky?

What can you see as you look up into the sky? If the day is clear, you may see the sun. How brightly it shines! The light from the sun makes daylight wherever it shines. The sun is so bright that you should not look right at it. So bright a light will hurt your eyes.

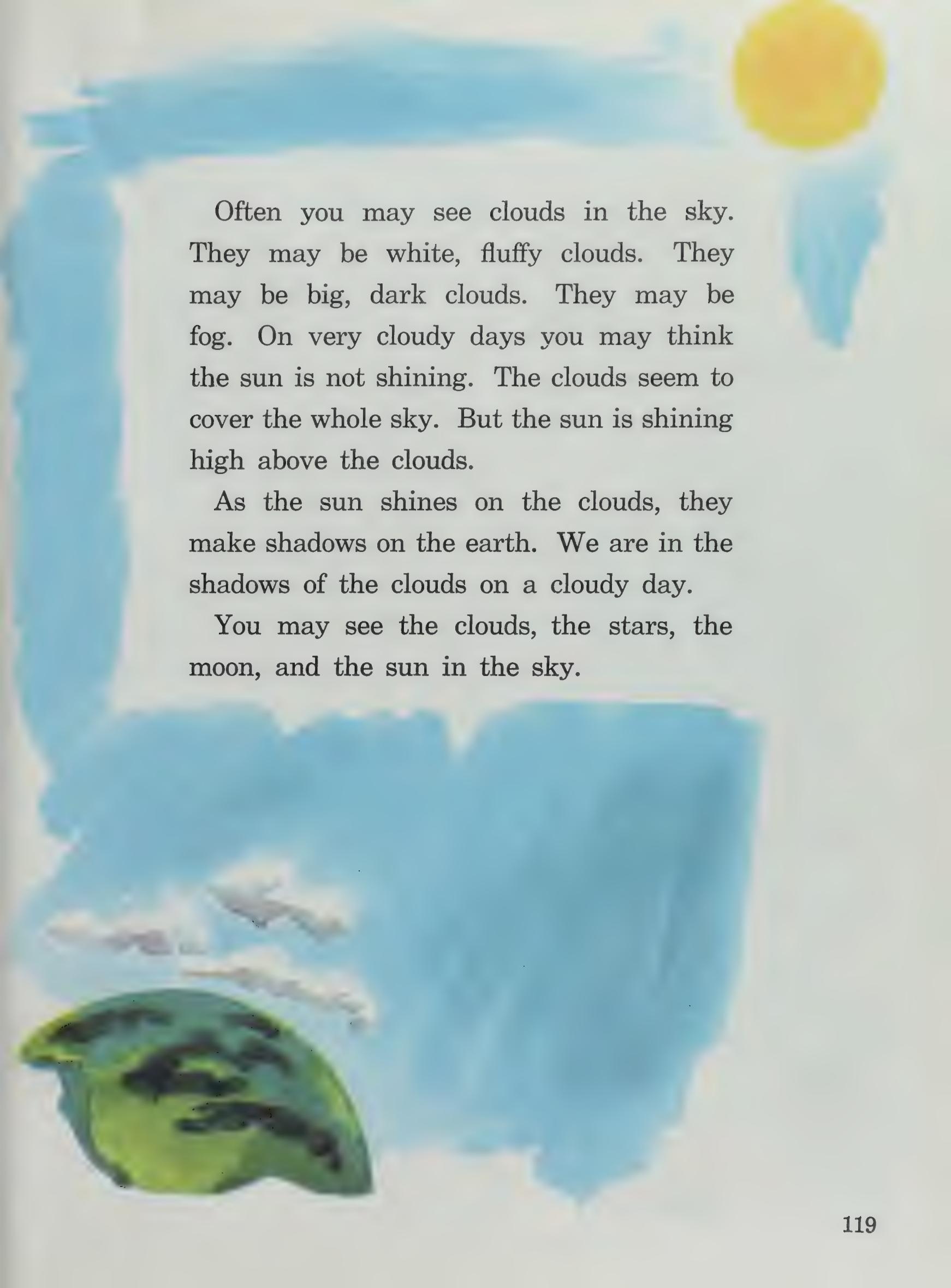
The sun shines brightly. It is brighter than any electric light on earth. It is brighter than many electric lights. Sunlight is brighter than moonlight. It is brighter than starlight.

Sunlight is the brightest light we know.



At night you may see the moon in the sky. Sometimes the moon shines very brightly. When you walk outdoors in the moonlight, you can easily see where you are going. You can see houses and trees and bushes. But moonlight is not bright enough to read by. Even with moonlight, we use electric lights in order to see well. Moonlight is never as bright as sunlight.

We can often see stars in the night sky, too. Stars give some light to the earth. But the light that the earth gets from them is not very bright. Sunlight and moonlight are much brighter than starlight.



Often you may see clouds in the sky. They may be white, fluffy clouds. They may be big, dark clouds. They may be fog. On very cloudy days you may think the sun is not shining. The clouds seem to cover the whole sky. But the sun is shining high above the clouds.

As the sun shines on the clouds, they make shadows on the earth. We are in the shadows of the clouds on a cloudy day.

You may see the clouds, the stars, the moon, and the sun in the sky.

# The Big, Bright Sun



The sun is the largest thing you see in the daytime sky. The sun is larger than your town. It is larger than the moon. It is larger than the earth.

The sun does not look as large as the earth or the moon, but it is. The sun looks small because it is so far, far away.



Think how small a very large airplane looks when it is high up in the air. As it flies farther and farther away, it looks smaller and smaller. Think how small a big ship seems when it is away out on the water.



The sun is bigger than any airplane or ship. But it is many, many times farther away too. The sun looks so small to us because it is far, far away.

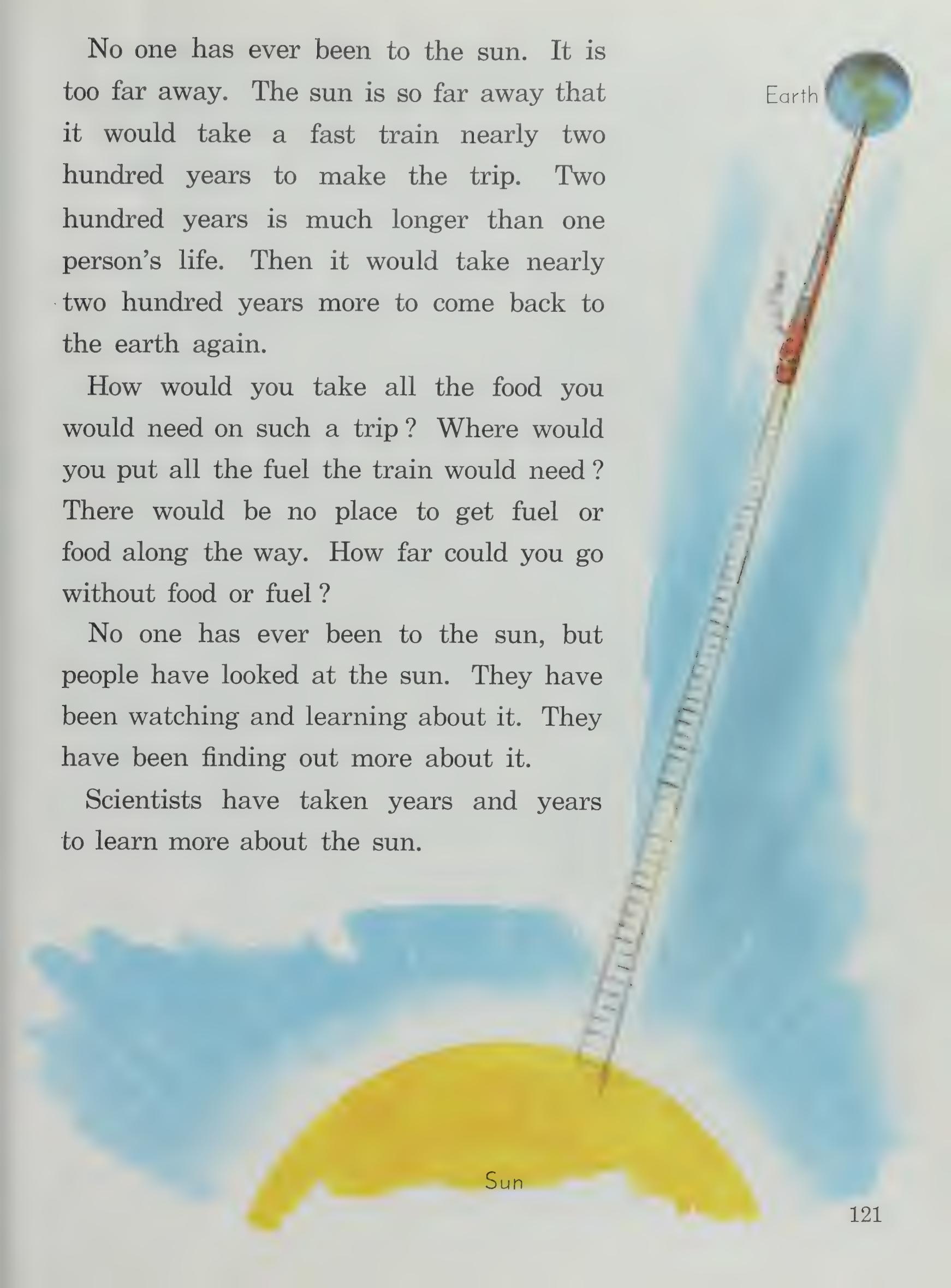
Large things look much smaller when they are far away.

No one has ever been to the sun. It is too far away. The sun is so far away that it would take a fast train nearly two hundred years to make the trip. Two hundred years is much longer than one person's life. Then it would take nearly two hundred years more to come back to the earth again.

How would you take all the food you would need on such a trip? Where would you put all the fuel the train would need? There would be no place to get fuel or food along the way. How far could you go without food or fuel?

No one has ever been to the sun, but people have looked at the sun. They have been watching and learning about it. They have been finding out more about it.

Scientists have taken years and years to learn more about the sun.



Earth

Sun



Scientists tell us that the sun is made of gases. It is not solid like the rocks of the earth. It is made of gases, like the air.

Scientists tell us that oxygen is one of the gases found in the sun. But the sun's gases are so hot that they glow. The sun is hot, but it is not burning. It glows in much the same way that the wires glow in an electric heater.

There are heat and light in the glow from the heater. The glow of the sun is greater than the glow from any heater on earth.

The sun shines with its own light. Its light comes from the hot, glowing gases of which it is made.

Sunlight is bright. It is warm. Sometimes sunlight is very hot. Some people put on dark glasses and big hats to keep the bright sun out of their eyes. When the sun is very warm, many people want to find a shady spot.





Light and heat go out from the sun in all directions. Only a very small part of all the sun's heat and light comes to the earth. But this small part of the sun's light and heat is very important to us.

Enough heat and light come to the earth from the sun to keep us warm and give us daylight. Sunlight warms the soil. It helps plants to grow.

Without this sunlight, plants and animals could not live and grow. The earth would be so cold that everything would freeze solid. The whole earth would be dark. There would be no daylight, for daylight is sunlight.

Most of the heat and light which the earth gets comes from the sun. We could not live without the sun.



## Sunlight and Color

The brightest light you see on the earth comes from the sun. People sometimes use electricity to give light to the places where sunlight does not shine. Houses and towns are lighted at night by electric lights. But there is no light on the earth as bright as sunlight.

What color do you think sunlight is? Is it yellow? Is it white? Does it have any color?

There are many colors in a beam of sunlight. You can sometimes see these different colors.



Have you ever seen a rainbow? If you have, you have seen the colors in sunlight. When the sun shines through the drops of rain, the water scatters the light in the sunbeams. Then you see the colors as a rainbow.

You can often see a rainbow when the sun shines through the water from a garden sprinkler. Sometimes you may see a rainbow when sunlight shines through a corner of your aquarium. The water in the aquarium scatters the light so that you can see different colors.

A piece of glass called a prism may be used to scatter a beam of sunlight to show the colors. When sunlight shines through the sides of the prism, all the colors of the rainbow can be seen.

Susan is using a prism to see the colors in sunlight. If you have a prism, try this experiment.

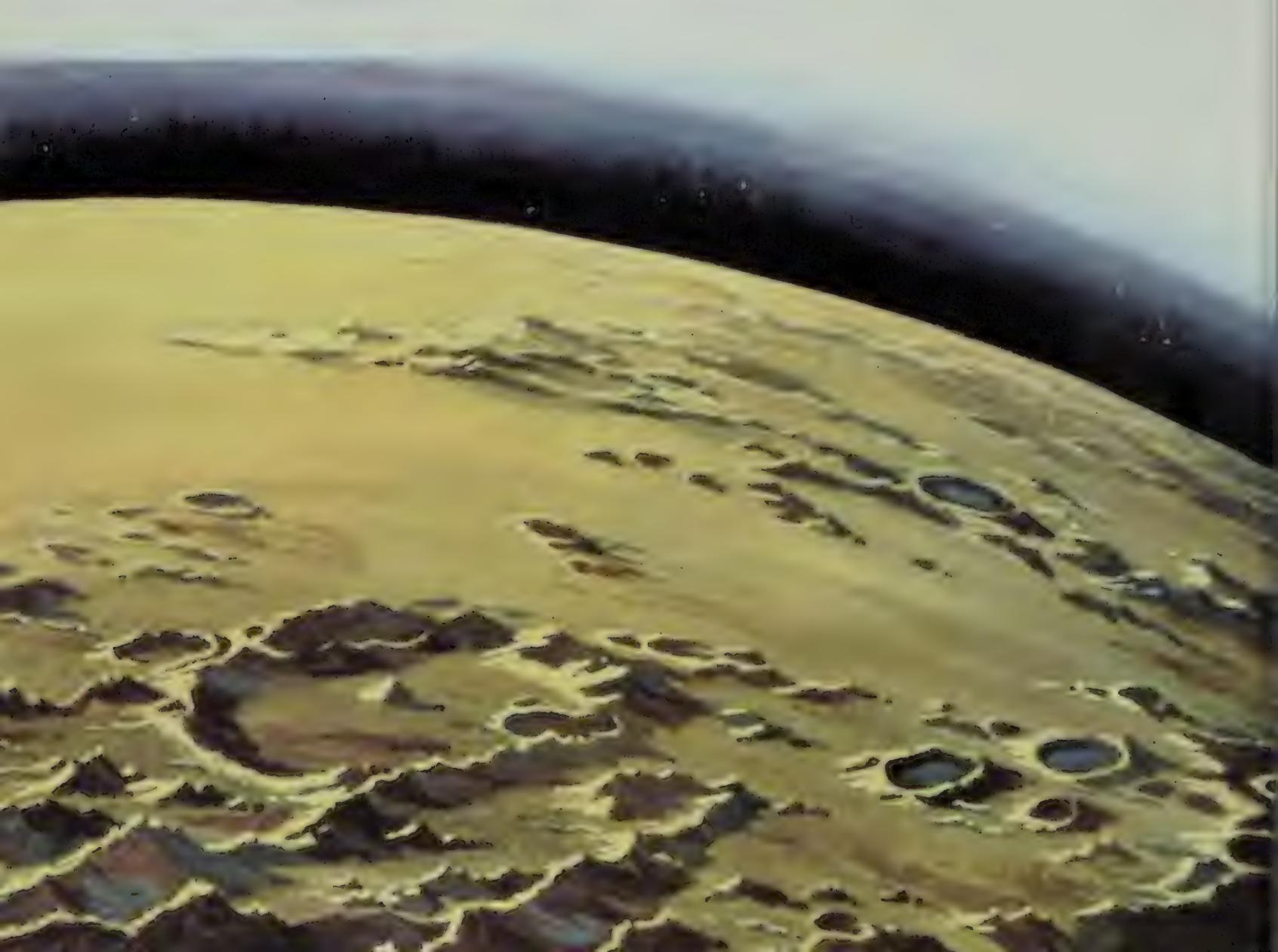


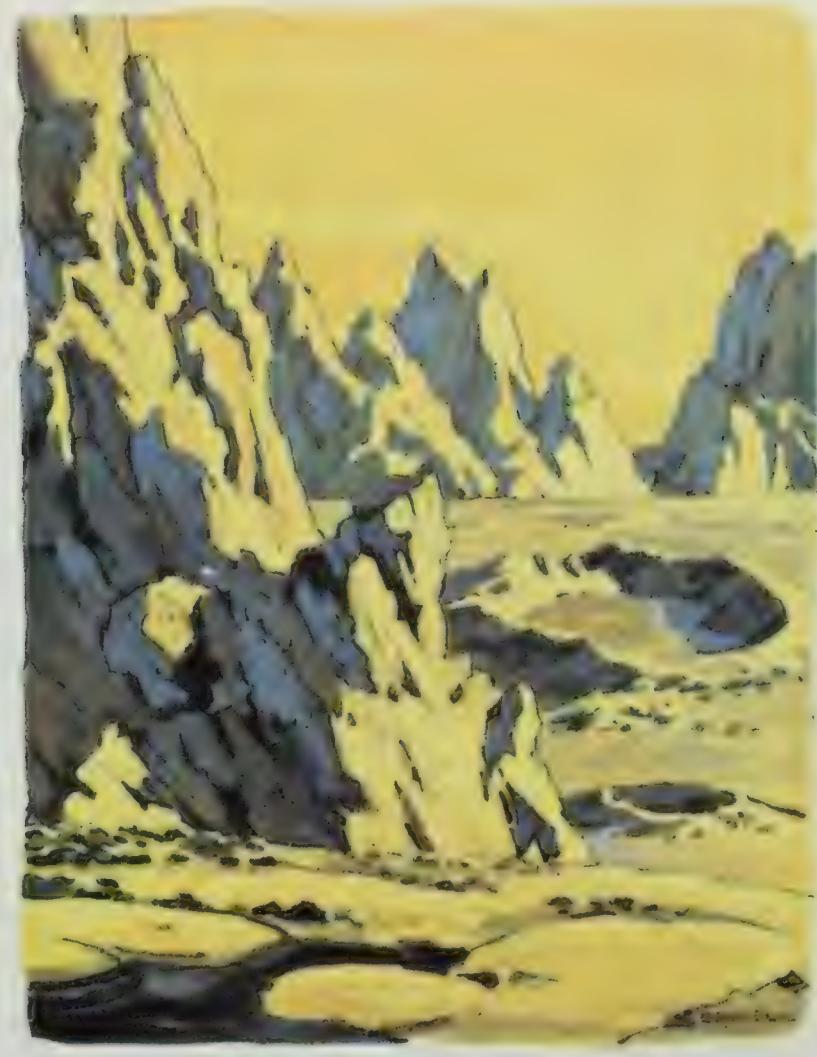
# The Moon and the Earth

The moon is much smaller than the sun. It is smaller than the earth. The moon is very much nearer the earth than the sun. It is our nearest neighbor in the sky. For this reason, scientists have found out many things about the moon.

Scientists can tell us about how the moon looks. They have taken pictures of it.

Here is a drawing that shows part of the moon. It is made from a picture taken by a scientist.



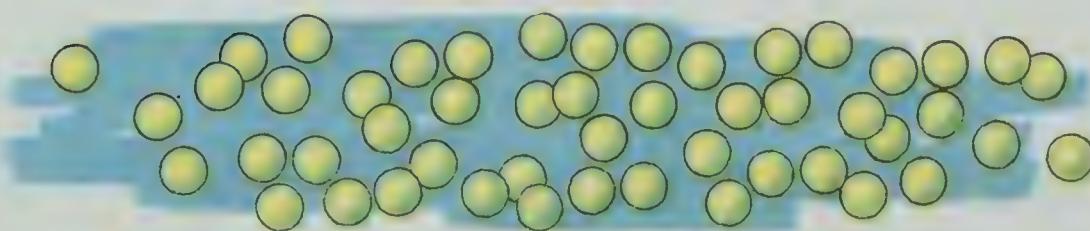


Scientists tell us that the moon is like the earth in some ways. The moon is round like the earth. It is solid just as the rocks on the earth are solid.

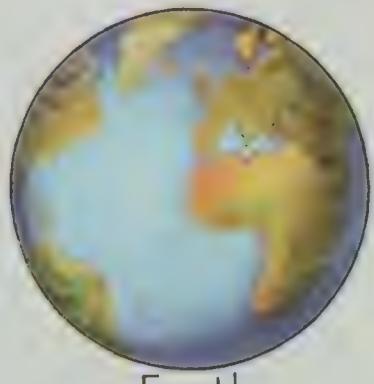
The moon gets light and heat from the sun just as the earth does. Sunlight makes day on the moon. The heat from the sun makes the rocks on the moon very, very hot.

There are mountains on the moon very much like the mountains on the earth. In the pictures above, you can see earth mountains and moon mountains. How are they the same? In what ways do they look different?

In some ways the moon is different from the earth, too. The moon is much smaller than the earth. About fifty balls the size of the moon could be put inside a ball the size of the earth.



Fifty moons could be put inside the earth



Earth

Scientists say that the moon would not be a pleasant place for us to live. The moon is very hot by day and very cold by night. You could not keep warm at night on the moon.

Some scientists say that there is little if any air on the moon. There is no great ocean of air around the moon, as there is around the earth.

Scientists say that there are no clouds on the moon. The clouds you see are in the air around the earth. They are very near the earth. Scientists say that there is no rain on the moon. There are no lakes or rivers.

On the moon there are no plants or animals such as we know.

What a bare, dry place the moon must be !

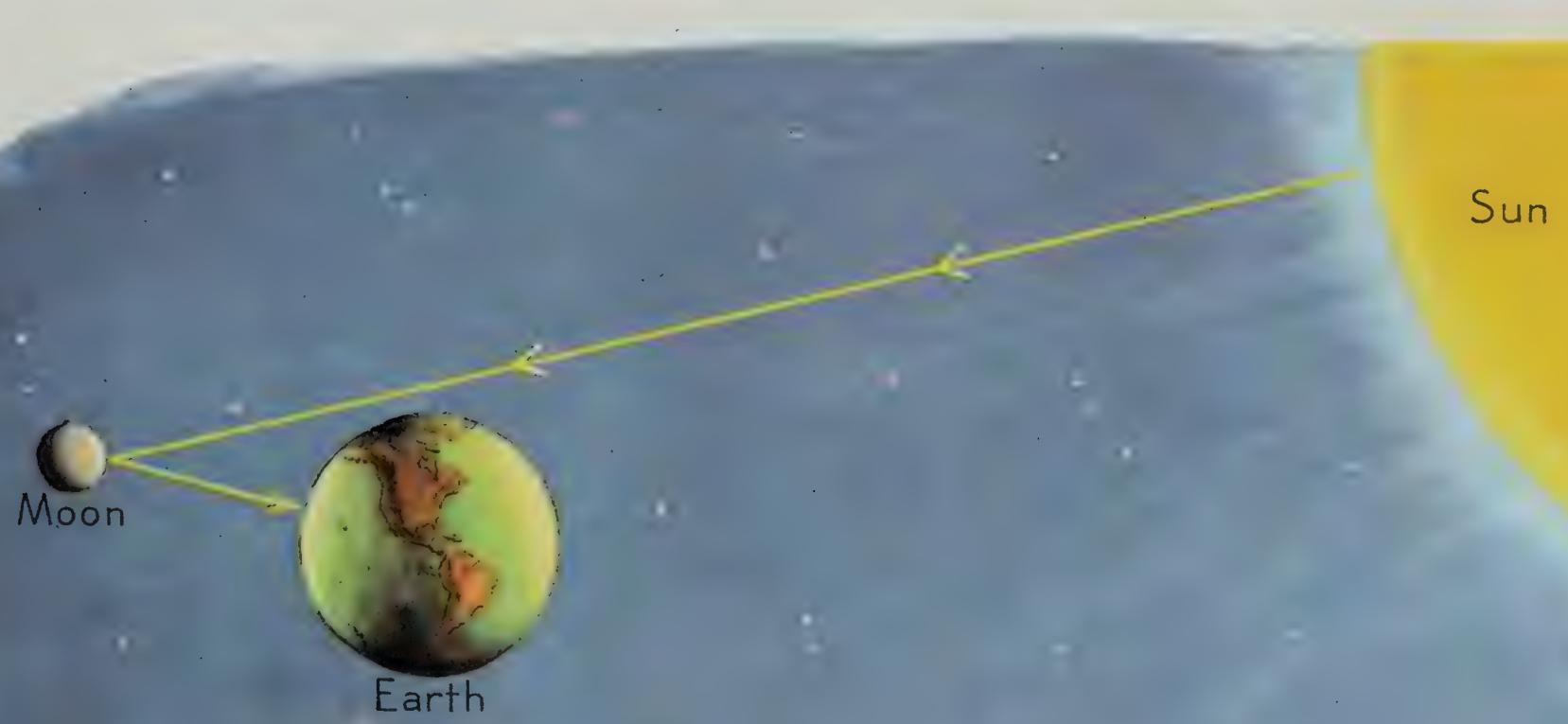
# How the Moon Shines

Moonlight is very different from sunlight. Moonlight does not feel warm. It is never as bright as sunlight.

You know that the sun's light comes from the hot, glowing gases of which the sun is made. But the moon is not made of gases. The moon is solid. There are many rocks on the moon. These rocks do not glow as the sun's hot gases do.

The moon is like a round, dark globe. It has no light of its own.

"Then where does the moonlight come from?" you ask. You may be surprised to know that moonlight really comes from the sun!

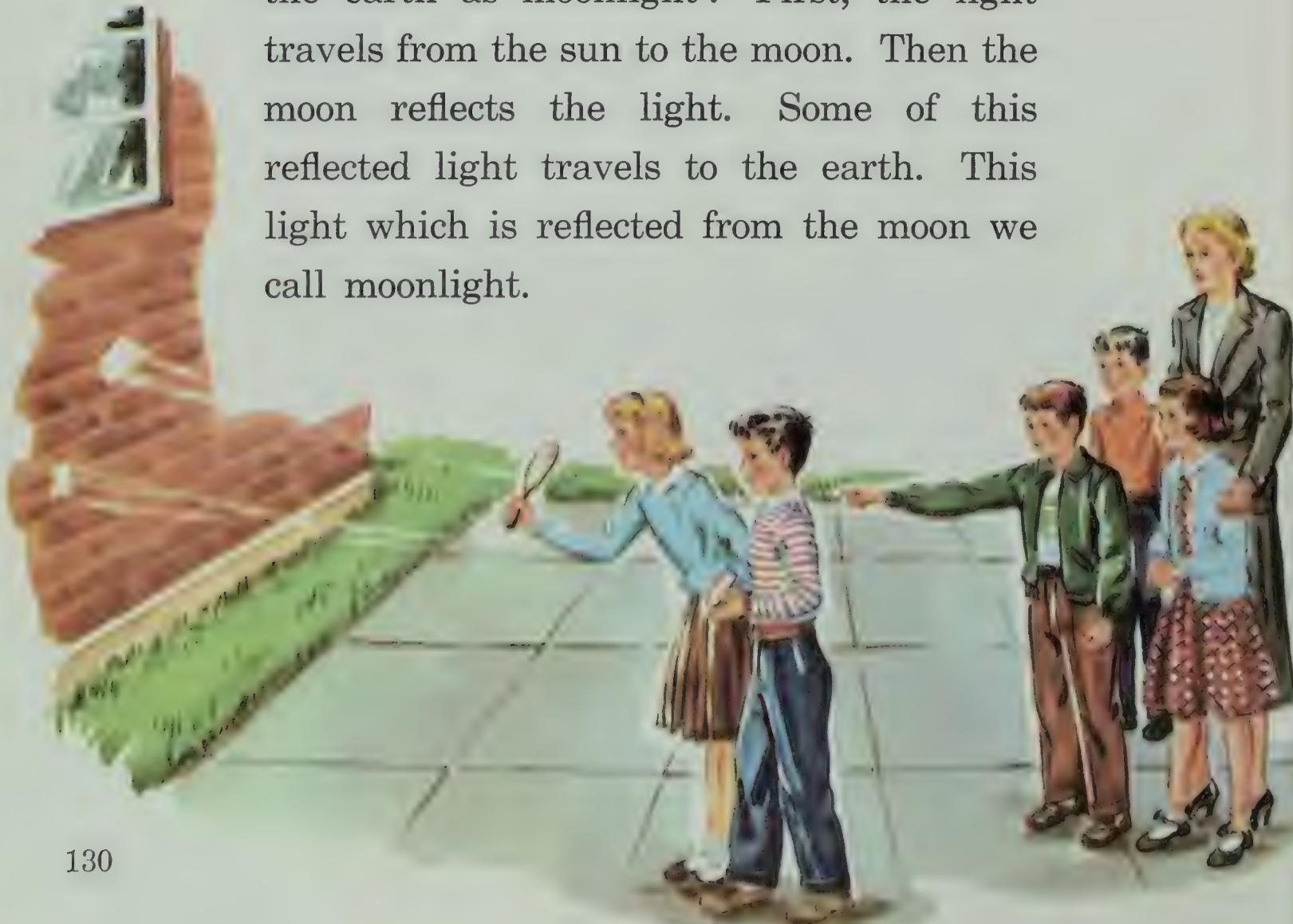


The sun shines on the moon. Then the moon reflects that light to the earth in much the same way that light is reflected from a mirror.

When you hold a mirror in the sunlight, the light strikes the mirror. Then the light is reflected off the mirror and shines somewhere else. With a mirror you can reflect a beam of sunlight.

The moon acts somewhat like a big, big mirror. It reflects some of the sunlight which it gets.

What a long way light travels to reach the earth as moonlight! First, the light travels from the sun to the moon. Then the moon reflects the light. Some of this reflected light travels to the earth. This light which is reflected from the moon we call moonlight.



## Watching the Stars

When you look into the sky on some nights, you may see many, many stars. Some stars seem very bright, and some seem dim and faraway.

How many stars are there? There are more than you can count. No one really knows just how many there are. New stars are being found all the time as scientists watch and learn about the sky.

There are big stars and little stars, bright stars and dim stars. You cannot always tell just how large or small a star is by just looking at it. A little star close to the earth may seem very large and bright. And a large star that is far away may seem small and dim.

Some light from the stars comes to the earth. This is starlight. Starlight is not as bright as moonlight.

## A Game for You

Here is a game for you to play. Read each one of the things below. Try to guess what each tells about. Find out how good you are at this game.

1. I am very bright. My heat warms the earth. What am I?
2. You can see me in the sky at night. I give some light to the earth. My light is never as bright as sunlight or moonlight. What am I?
3. I am round like the earth. I am solid like parts of the earth. I have no light of my own. What am I?
4. I am very large. I am made of hot, glowing gases. My heat and light go out in all directions. Without my light and heat, nothing could live on the earth. What am I?
5. I am somewhat like a big mirror in the sky. I reflect light to the earth. What am I?
6. You can often see me in the daytime sky and in the night sky. I may be fluffy and white or big and dark. I sometimes hide the sun. What am I?

## Some Things to Do

1. On a bright moonlight night stand outdoors. Look about you. Can you see things clearly? Can you see across the street or to the other side of your yard? Can you see shadows? Is there enough light to read by? Does the moonlight feel warm?
2. Make a class book of pictures of the moon.
3. On a sunny day place a thermometer in the bright sunlight. Place another thermometer in the shade. Leave them for a few minutes. Then look to see what each temperature shows. What are the two temperatures? Which thermometer shows the higher temperature? How much warmer is it in the sun than in the shade?
4. With colored paper or paints, make a rainbow to show the colors in sunlight.
5. Take a make-believe trip to the moon. Tell about all the things you would need to take with you. How would you get there, and how would you get back to earth again?

A vibrant, colorful illustration depicting a park scene. In the foreground, a young boy in a blue shirt and dark pants stands at a white pedestal fountain, leaning forward to drink from a spout. A young girl in a red and white checkered dress stands beside him, holding a small glass. The background features a large, multi-story yellow building with many windows, surrounded by green trees and a grassy hillside. A path leads towards the building through a garden with various flowers and a small stream or pond. The sky is a clear, light blue.

# Using Water Wisely

# Living Things Need Water

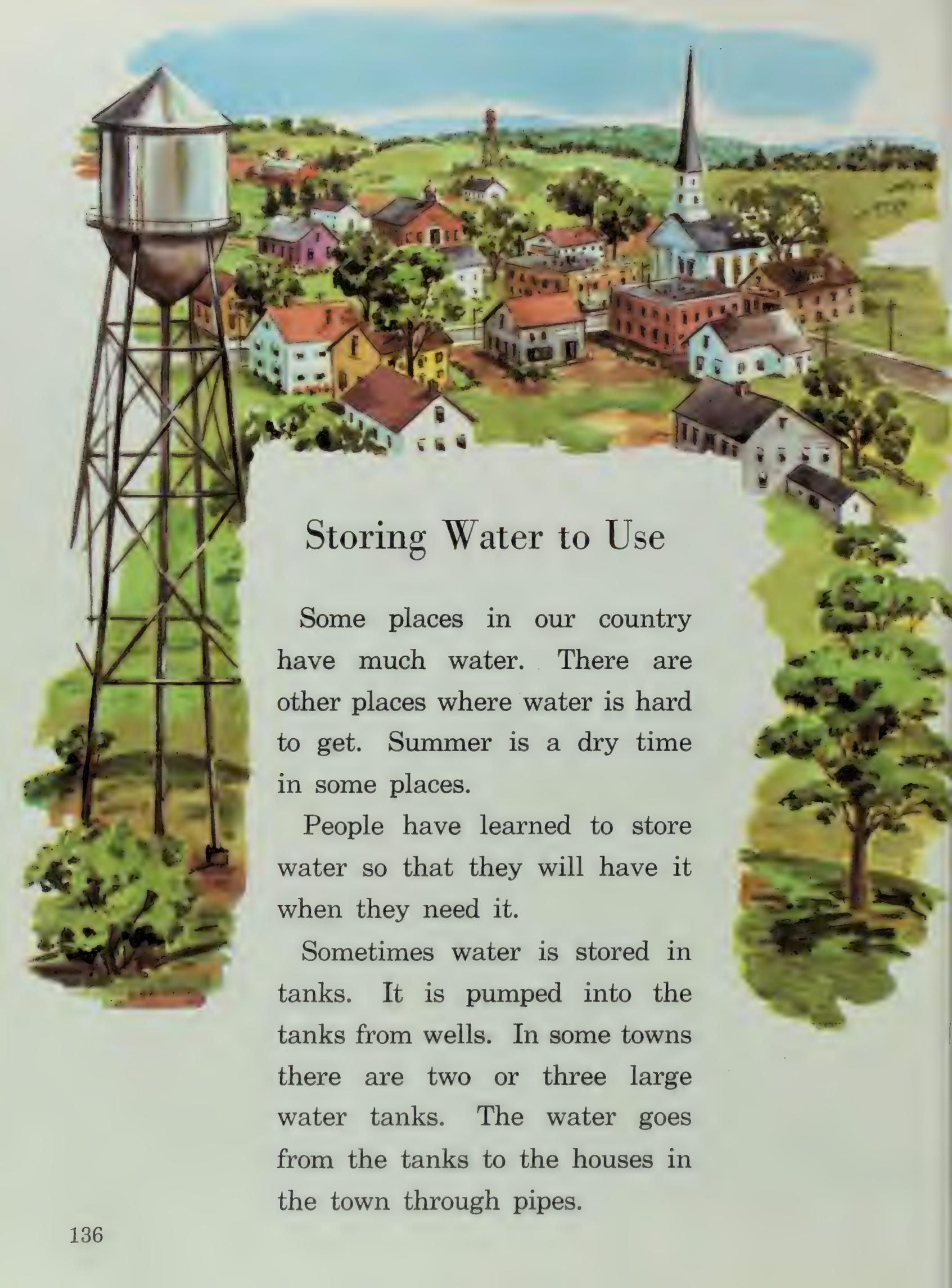
Have you ever stopped to think how many times a day you get a drink of water?

You need water. Other living things need water, too. Cows and horses need water. Ants and other insects need water.<sup>61</sup> Fish and many other animals live in water. If there were no water in the rivers and oceans, these animals could not live.

Plants need water. Trees, grass, and flowers need water in order to live and grow.

Water is important to living things.





## Storing Water to Use

Some places in our country have much water. There are other places where water is hard to get. Summer is a dry time in some places.

People have learned to store water so that they will have it when they need it.

Sometimes water is stored in tanks. It is pumped into the tanks from wells. In some towns there are two or three large water tanks. The water goes from the tanks to the houses in the town through pipes.



In some places water is stored in lakes. Sometimes a large dam is made across a stream. This dam holds back the water and makes a lake. The water is stored in the lake until it is needed. Is there a lake like this near your home? Is there a dam near your home?



On many farms and ranches water is stored in ponds. Animals drink the water from these ponds.

# Ways to Use Water



People use water to drink and for cooking.



Firemen often use water to put out fires.



People use water for their gardens. The water keeps the gardens growing well.



Water is used to clean the streets. Water is used for many things.



## Water in Sally's Town

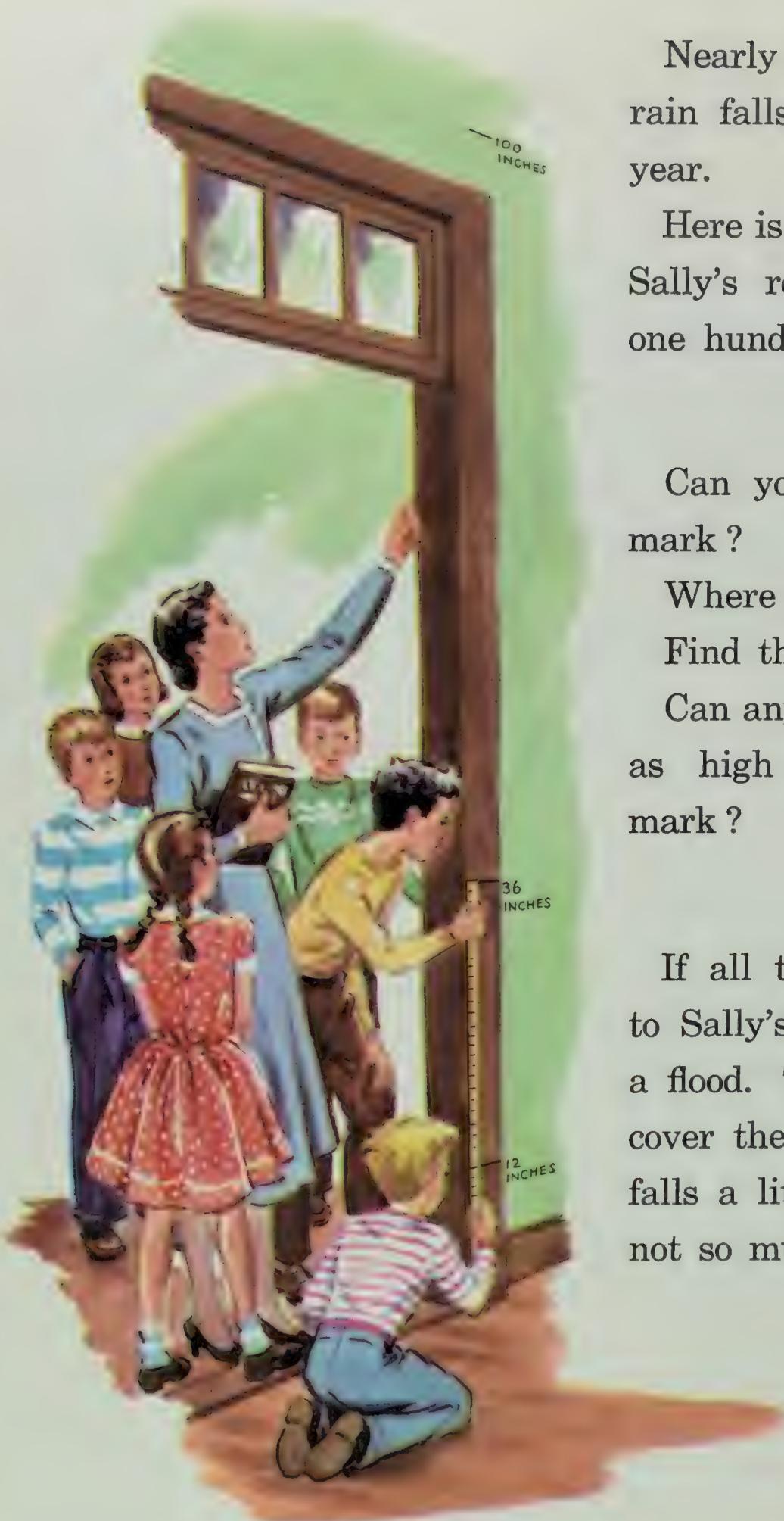
In Sally's town there is enough water for everyone to use.

Sally's father has a fine garden. Sally's mother has many flowers growing in her yard. The grass is green and soft.

Many of the trees in Sally's town are tall. They often grow along both sides of the street. In summer they help to keep the town cool and pleasant.

Where Sally lives, there is much rain in the wintertime. Sometimes the town is covered with a gray fog.

When the fog comes, it seems to cover everything.



Nearly one hundred inches of rain falls in Sally's town every year.

Here is the way the children in Sally's room at school marked one hundred inches.

Can you find the twelve-inch mark?

Where is the next mark?

Find the hundred-inch mark.

Can anyone in your class reach as high as the hundred-inch mark?

If all this rain came at once to Sally's town, there might be a flood. The flood would almost cover the town. When the rain falls a little at a time, there is not so much danger of a flood.



Some rain falls on the trees, the grass, and the gardens.

Some of the rain stays in puddles on the ground for a while. Then most of this water sinks slowly into the earth.

Some of the rain falls into the ponds and rivers and oceans.

Some of the rain falls on the houses and sidewalks. Much of this water evaporates into the air again.

The people in Sally's town store water. They have enough water to drink all the year.

There is enough water in the ground to keep plants growing well.

The people in Sally's town know how good it is to have all the water they need. They use the water wisely.



## Water on Paul's Farm

Paul lives on a farm where it is very dry. There is very little water near his home. There is not enough water to grow crops.

Water for the crops must be brought to the farm. The people near Paul's home use the water very carefully.

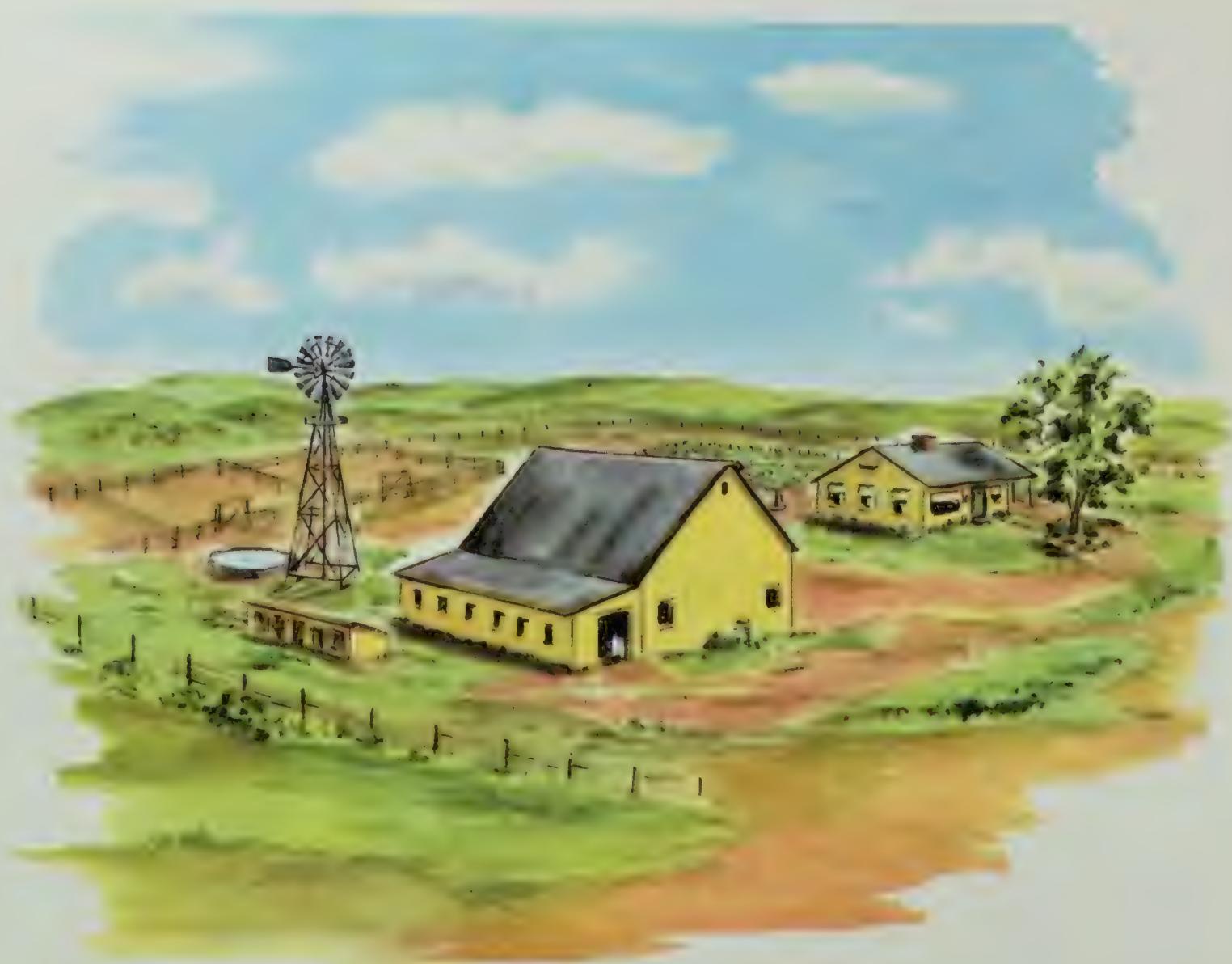
There are high mountains near Paul's home. Sometimes Paul can see rain falling in the mountains when the sun is shining at his home.

In the winter, snow falls in the high mountains. When the snow melts, it turns to water. Some of the water comes down to the farm in pipes and ditches. Then there is enough water for the crops.

Rain and snow in the mountains mean water on Paul's farm.

Look at the picture below.  
Does the land on both sides of the fence  
look the same?  
Can you tell which land gets the water?  
Use the picture to show what you think.





## Water at the Ranch

Joe lives on a cattle ranch. There is very little water on the ranch in the summertime. The days are very warm. Very little rain falls on the ranch in the summer months. This is a dry time of the year on Joe's ranch.

Only about twelve inches of rain falls in a whole year where Joe lives. Twelve inches is not much rain for a whole year.

Can you measure to find how much twelve inches is? This is all the rain that falls at Joe's ranch in a year.

How many inches of rain falls in a year in your town? Is this more or less rain than where Joe lives?

On Joe's ranch there are some water holes. The cattle come to these water holes to drink. If there has been enough rain, the water holes are full of cool water. The grass is green. The cattle have enough to eat and cool water to drink.

Sometimes there is not enough rain. The water holes dry up. The grass turns brown. There is no cool water in the water holes. Even the mud dries up, and there is only dust.





On Joe's ranch there are some wells and windmills. When the water holes dry up, Joe's father starts the windmills. They go round and round as the wind blows. They pump and pump the water from the deep wells.

The water goes into a big tank beside each windmill. Soon the tanks are filled with clean, cool water. Then the cattle may drink from the tanks.

There is a pump in Joe's yard.  
Joe's family uses water from this  
pump to drink.

His father puts some of the  
water from this pump on the  
garden.

Joe takes his baths in this  
water.

Joe's mother uses water from  
the pump for cooking and for  
washing the clothes.

Joe and his family know how  
important water is to them.  
Everyone in Joe's family uses  
the water carefully. If Joe and  
his family use the water wisely,  
they will all have enough.



# Water Where Ann Lives

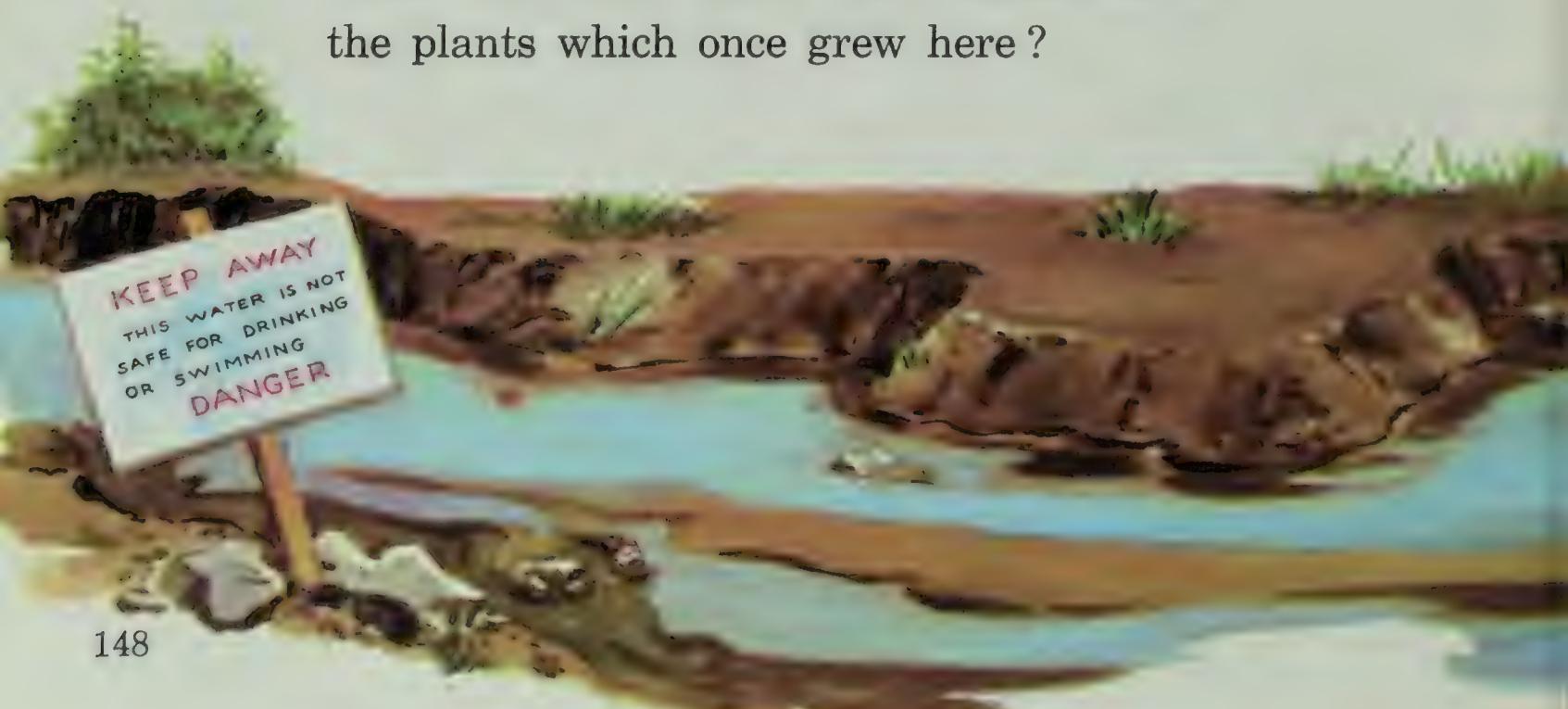
Ann lives where there are many ponds and brooks.

When Ann's mother was a little girl, she played by the brooks and the ponds. Now, if you were to visit Ann, you would see the sign below by many of the brooks.

Look at the brook in the picture. Would you like to play by this water, or sail your boat here? Do you think you would be likely to find fish here?

Most fish and snails and other water animals need clean water in which to live. Most fish and snails and other water animals cannot live well in water which is not clean.

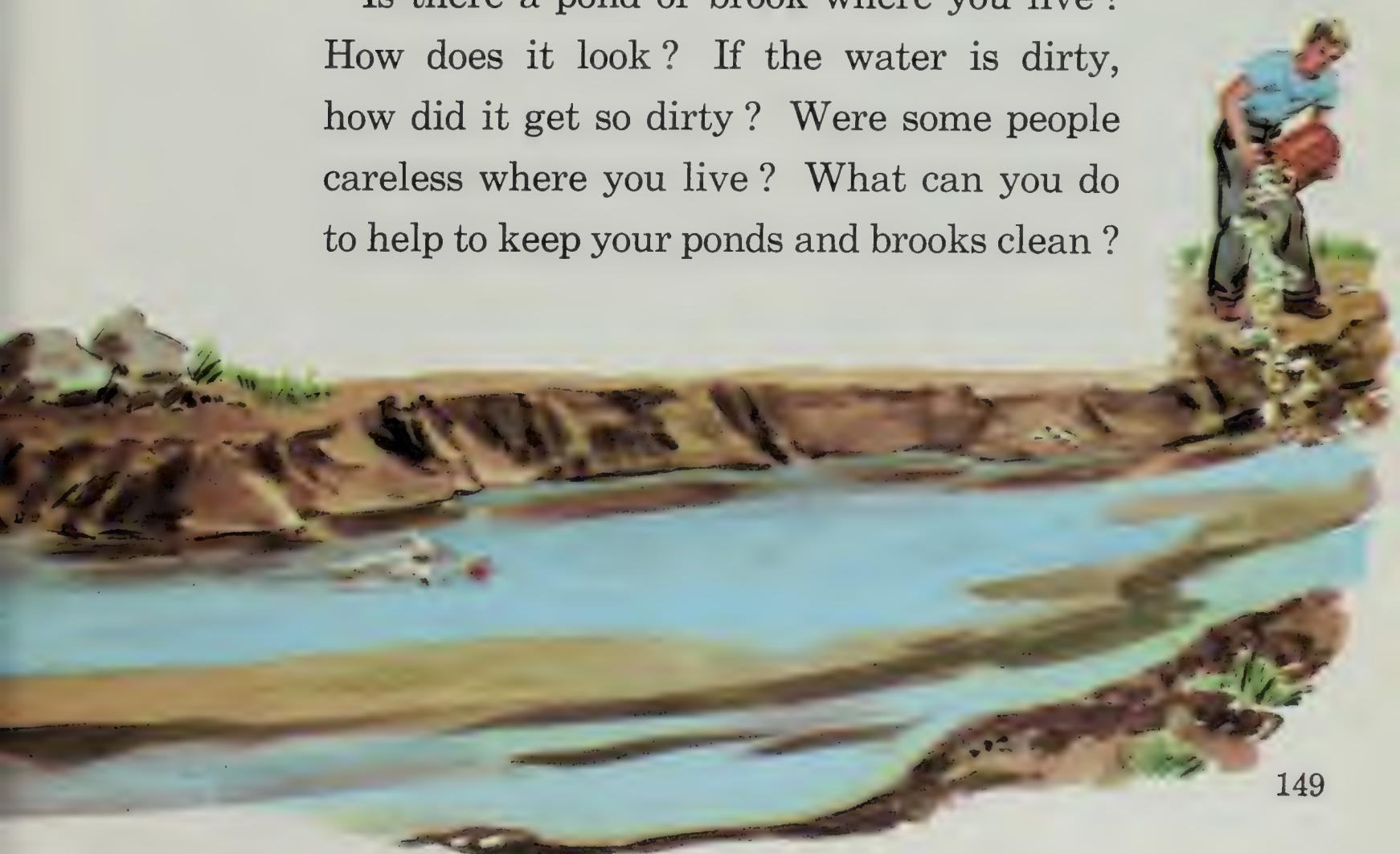
Look at the banks beside the brook. What do you think has happened to the plants which once grew here?



In Ann's town some people have been careless about the way they use the water in the ponds and brooks. They have not taken care to keep the brooks clean. Often they put paper and garbage into the ponds. Because the paper and garbage are dirty, the water does not have a pleasant smell.

It is not safe now for Ann or anyone in her town to drink water from these ponds or brooks. It is not safe, because the people have been careless. Perhaps the time will come when the brooks will be clean again. Then the people in Ann's town can enjoy the brooks and ponds once more.

Is there a pond or brook where you live ? How does it look ? If the water is dirty, how did it get so dirty ? Were some people careless where you live ? What can you do to help to keep your ponds and brooks clean ?





## Clear Creek

Susan's home is near Clear Creek. Find Susan's house and the creek in the picture. Do you think it would be pleasant to live near Clear Creek?

Does this water look like the brook where Ann lives?

No one in Susan's town puts paper or garbage into this creek. Everyone is careful not to put paper or garbage in the water.

This water is so clear that Susan can see the pebbles on the bottom when she walks along the bank. The pebbles are not covered with mud or paper or garbage. Many plants grow along the banks.

Many people enjoy Clear Creek. Some of the boys catch fish there. There is a park beside the creek. Susan and her friends like to have picnics in the park. It is pleasant to play beside Clear Creek.

Have you a park such as this in your town?

Do you have picnics in the park?





Sometimes in the winter the weather may get very cold. When this happens, the water in Clear Creek freezes. It changes to ice. Then the boys and girls may skate on it.

The people in Susan's town try to keep the water in their creek clean. Then they can enjoy the creek all through the year.

## Water for Plants

Plants need water in order to grow. Some plants grow in water. They float about on top of the water as it moves. Other plants grow in the wet soil at the bottoms of ponds and streams. Their long stems grow up through the water. Have you seen plants like the ones in the picture at the right?



Garden plants need water, too. Garden plants get water from the rain which falls. Father sometimes waters the garden when there is not enough rain. Mother waters her flowers.



Sometimes, in places where there is not enough rain, water is brought from far away. The water is put on crops. Without this water the crops could not grow.



## Water for Animals



Many animals make their homes in the waters of the earth. Fish, oysters, and sponges are some of the animals which live in the water.



Some animals live near the water and spend a part of their lives in ponds, streams, or rivers. Frogs are such animals. They come out of their eggs in the water and live there until their legs grow. Then they can hop about on land, but they do not go far from the water.



Animals which do not live in or near the water need water, too. Sometimes such animals may come to a water hole to drink. They may live in different places and eat different foods, but they all need water.

Animals need water in order to live. They get water in many ways.

# Water for Everyone

How important water is to all of us !

We drink water every day. We take our baths in water. We clean our teeth with water. Our clothes are washed with water. Water is used to cook many of the foods we eat. After we eat, the dishes are washed in water.

We enjoy the water on the earth in many ways.

We like to swim in it. We like to play in the waves along an ocean beach, or splash about in the water of a swimming pool.

We like to go fishing in water. We may fish in a cold, clear mountain stream or perhaps from a boat. We can spend many hours fishing.

Sometimes it is fun to take boat rides on the water.





We enjoy the lakes and rivers and oceans  
as we travel about the country on trips.  
We like to look at the splashing waterfalls.  
Water makes the earth more beautiful.

Water! Water! Water! We use it every day. We could not live without it. We must learn to use it wisely if there is to be enough water for everyone.

## Some Things for You to Do

1. For three days keep a list of all the ways you use water. How many times a day do you turn on the water? How often do you get a drink?
2. What animals where you live make their homes in the water? Make a list of these animals.
3. Paint or draw your own pictures showing many different ways that people use and enjoy water.
4. Draw pictures for a class book showing how animals and plants use water.
5. Find out where you get the water you use. Does it come from a lake, a water tank, or some other place? How does this water get to your house?
6. Talk with the other children in your class about the things you can do to keep the ponds and brooks in your town clean.

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